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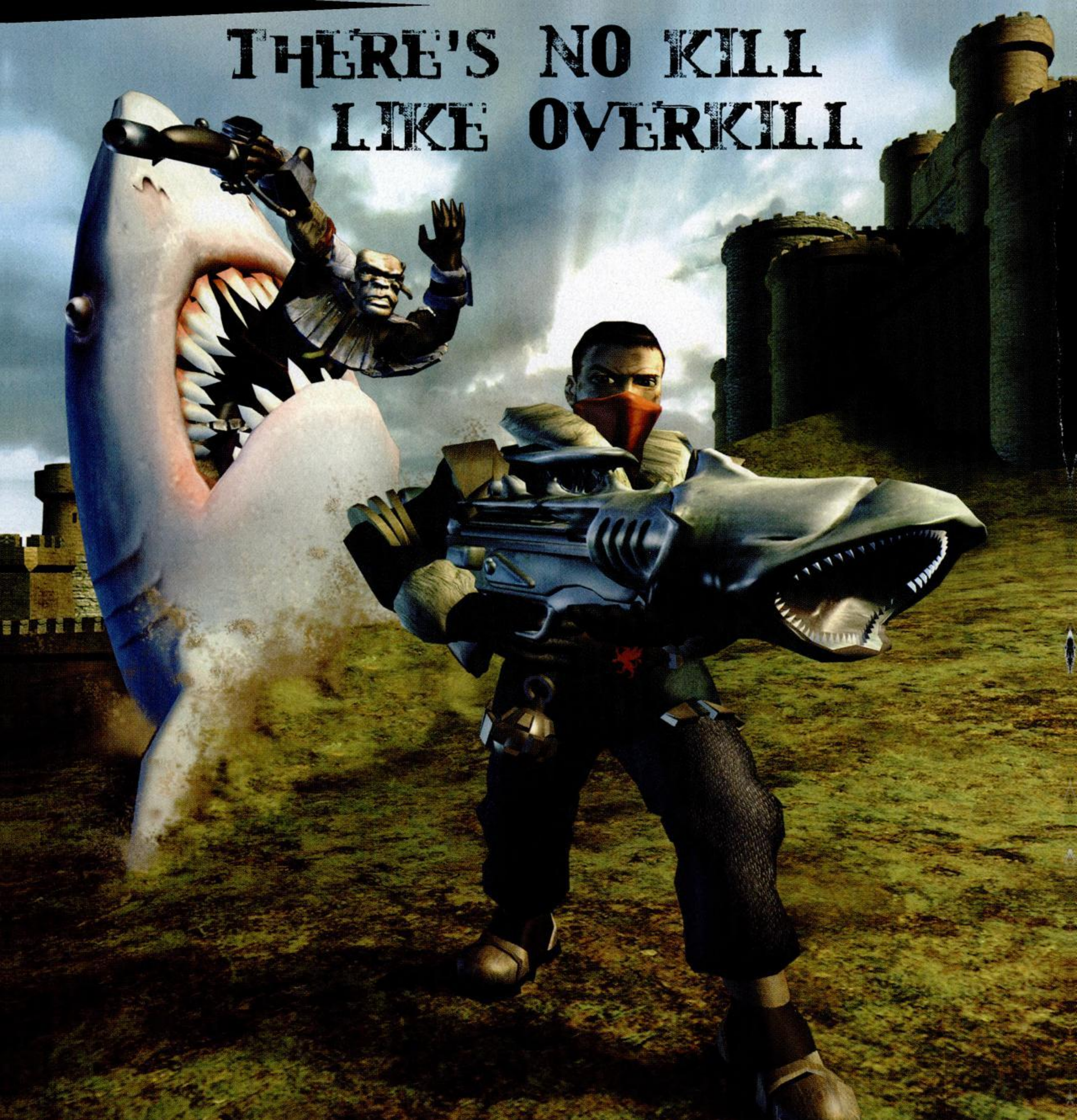

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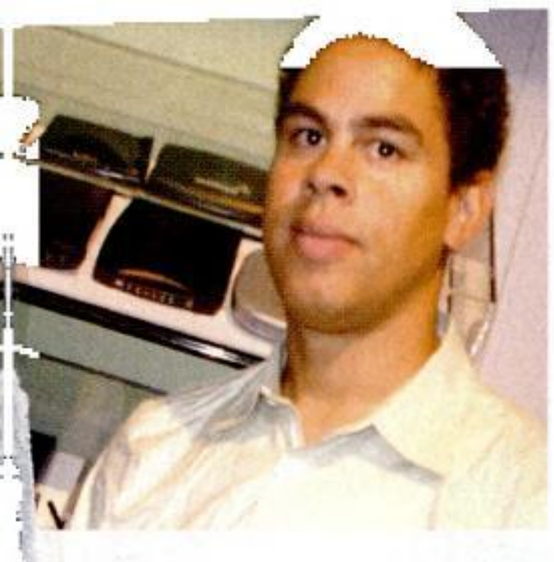


Release Notes

The Gut-Wrenching Dilemma

Like it or not, we're a review-oriented society. Formal reviews in newspapers help us determine whether we want to see the latest Brad Pitt epic. Word-of-mouth reviews determine whether we buy the latest 3D shooter. Corporate performance reviews determine how much money we make—or don't make. And, judging by the slew of passionate reader e-mails I receive every month, *Maximum PC's* reviews influence your PC purchasing decisions in a gigantic way.

I like to call the reviewing process "delicately straightforward" because analyzing a PC system, antivirus app, game, or any other product requires a delicate balance between opposing tensions: lab results vs. real-world testing, envelope-pushing vs. practicality, objectivity vs. subjectivity.

As an example, when we review a PC, our impressions are largely based on how fast it performs in *SYSmark 2004,* our key benchmarking test, but we also take into account the structural integrity and aesthetic appeal of the case, as well as the tidiness of the system's innards. Reviewing games, software, and digital cameras, on the other hand, can feel almost entirely subjective.

Granted, this subjectivity is governed by *Maximum PC's* emphasis on brutal honesty, speed, power, innovation, and high-end functionality, but product reviews still create many heated conversations every month.

Because we tend to focus on high-end products that often boast next-gen technologies, feature sets, and performance, our review ratings process is even more gut-wrenching for us. Do you penalize a product for executing an amazingly cool, never-seen-before feature that isn't all that practical or is functionally limited? And, conversely, do you penalize products that don't push the envelope, but execute existing technology flawlessly?

Take, for example, this month's review of Toshiba's e805 PocketPC handheld (reviewed on page 68). With a 640x480 display, it is clearly ahead of the PDA tech curve, but unless you use a third-party hack, the VGA mode is limited to a few apps. So does it get penalized? After much soul-searching, features editor Logan Decker decided that the innovation of viewing your PDA in a higher resolution was worth a Kick Ass score.

An even tougher example in this month's issue is Intel's new Pentium 4 Prescott CPU, which Senior Editor Gordon Mah Ung sinks his teeth into on page 28. With its advanced architecture, awesome scalability, and increased pipeline, this CPU will likely be a fan favorite within a year or two, but for now, it lags behind the company's existing P4 Extreme Edition chip. So what's the verdict? Our eight page story will clue you in.

As always, I'm curious about your thoughts on the matter, so drop me a line!

—GEORGE JONES
george@maximumpc.com

Contents

03.04

Page 14: Why games don't come on DVD

Page 20: Hotmail vs. Yahoo!

Page 18: Eyetop Centra Portable Display

REGULARS

6 In/Out
C'mon, readers, tell us what's on your minds. We can take it.

13 Quick Start
PC previews, news, factoids... and Windows XP Service Pack 2 dissected.

20 Head2Head
Yahoo! or Hotmail? Find out which free e-mail client serves cheapskates best.

24 WatchDog
If the Dog had only three legs, he'd be a tri-pawed. But would he still be such a fierce advocate for consumers' rights?

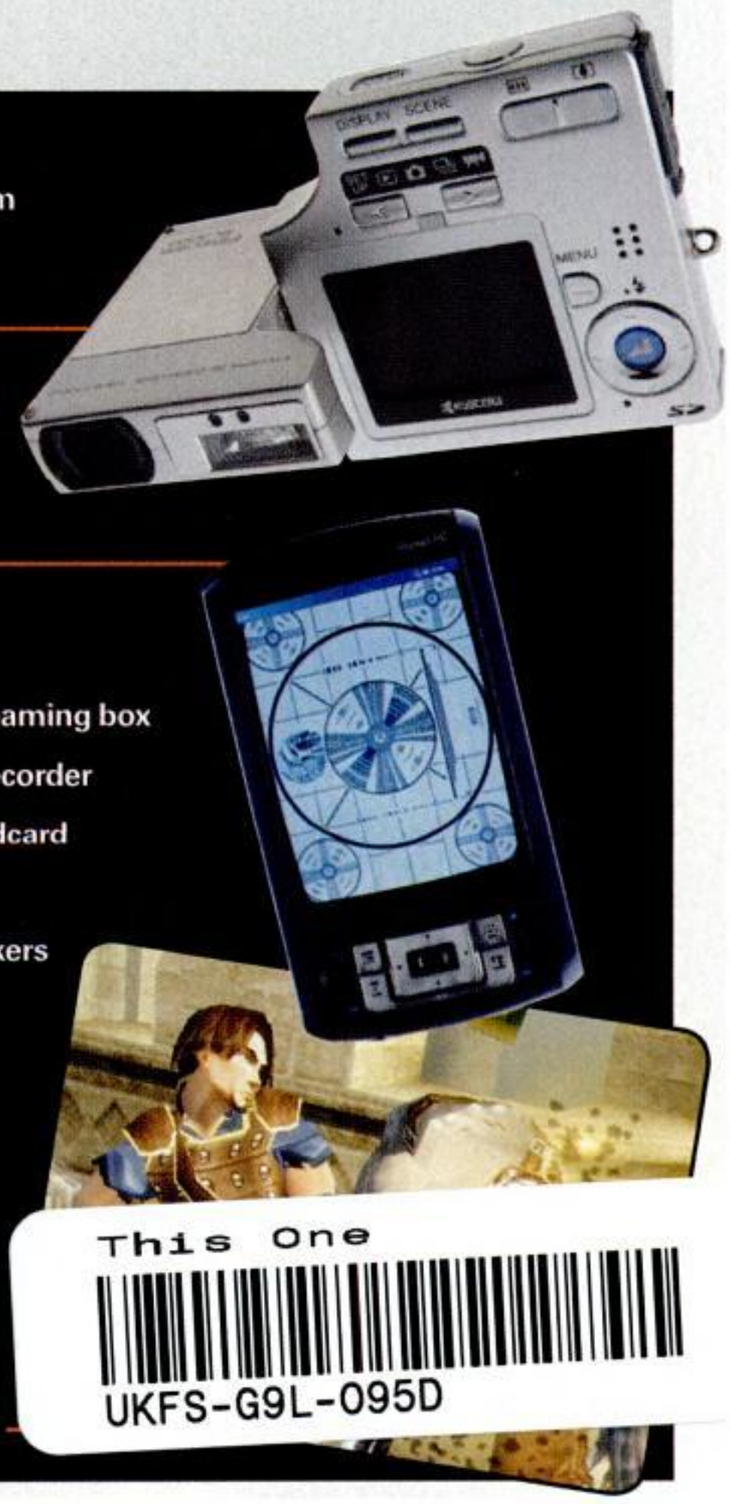
56 Ask the Doctor
Do you have an old, tired, or illin' PC? Maybe it's time you paid a visit to the Doc.

58 How To...
Connect to your home PC from anywhere in the world. Plus, tips for shopping wisely online.

104 Rig of the Month
Maybe *you* can figure out why this month's mod is called "Come Fly With Me."

REVIEWS

62 Vicious PC Assassin desktop system
64 Belkin Bluetooth GPS Receiver
64 Kyocera FineCam SL300R
66 AOpen AK86-L 64-bit mobo
66 Albatron K8X800 64-bit mobo
66 MSI K8T Neo-FIS2R 64-bit mobo
68 Toshiba e805 PDA
70 Creative Labs Wireless Music MP3 streaming box
70 Slim Devices Squeezebox MP3 streaming box
72 Addonics 18-in-1 Multi-Function Recorder
72 Mad Dog Entertainer 7.1 DSP soundcard
74 Iogear MiniView III USB KVM
74 Acoustic Authority A-3780 2.1 speakers
75 MediaRecover data recovery app
75 Arrowkey CD/DVD Diagnostic
76 Adobe Photoshop CS
77 Norton AntiVirus 2004
77 McAfee VirusScan 2004
77 AVG Anti-Virus
78 Armed and Dangerous
78 Prince of Persia: The Sands of Time



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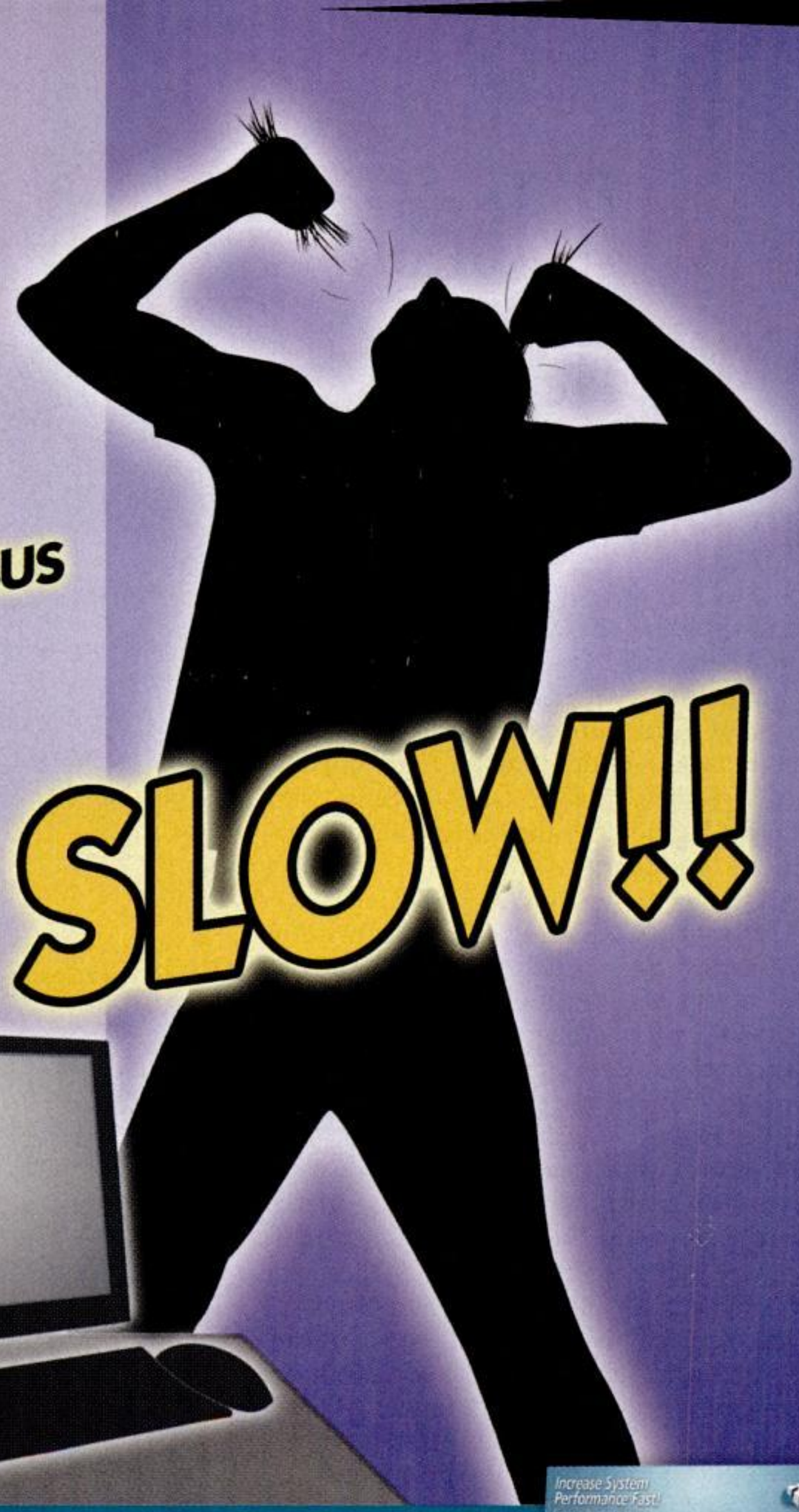

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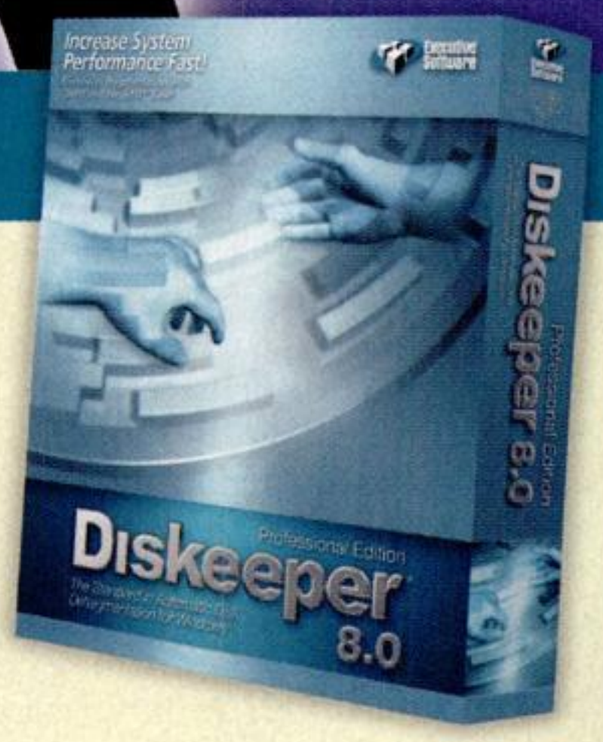

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EDITORIAL
George Jones EDITOR-IN-CHIEF
Katherine Stevenson MANAGING EDITOR
Gordon Mah Ung SENIOR EDITOR
Will Smith TECHNICAL EDITOR
Logan Decker ENSIGN
Josh Norem DISC PRODUCER, CAT LOVER
Andrew Sanchez EDITOR EMERITUS

ART
Natalie Jeday ART DIRECTOR
Boni Uzilevsky ASSOCIATE ART DIRECTOR
Mark Madeo PHOTO EDITOR
Samantha Berg ASSOCIATE PHOTOGRAPHER

CONTRIBUTING EDITORS
Tom Halfhill, Thomas McDonald

CONTRIBUTING WRITERS
Jason Compton, Dwight Looi, Mark Edward Soper

CONTRIBUTING ILLUSTRATOR
Dave McKay

PRODUCTION
Richard Lesovoy PRODUCTION DIRECTOR
Glenn Sadin PRODUCTION COORDINATOR

ADVERTISING
Chris Coelho PUBLISHER
Bernard Lanigan EASTERN AD DIRECTOR 212.768.2966 EXT. 4001
Dave Lynn WESTERN AD DIRECTOR 949.360.4443
Stacey Levy WESTERN AD MANAGER 925.964.1205
Sharon Kiernan EASTERN AD MANAGER 781.416.2018
Nate Hunt NATIONAL ACCT MANAGER 415.656.8536
Jose Urrutia ADVERTISING COORDINATOR 415.656.8313
Kathleen Reilly MARKETING MANAGER

CIRCULATION
Tina K. Rodich GROUP CIRCULATION DIRECTOR
Angela Martinez NEW BUSINESS DIRECTOR
Mimi Hall NEWSSTAND MANAGER
Janet Amistoso DIRECT MARKETING SPECIALIST

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How to contact us:
All subscription Inquiries 800.274.3421 or maxcustserv@cdsfulfillment.com
Editorial staff input@maximumpc.com

future network usa

FUTURE NETWORK USA
150 North Hill Dr. Brisbane, CA 94005
415.468.4684 www.futurenetworkusa.com

Jonathan Simpson-Bint PRESIDENT
Tom Valentino VICE PRESIDENT/CFO
Charles Schug VP/GENERAL COUNSEL
Holly Klingel VP/CIRCULATION
Matt Firme VP/EDITORIAL DIRECTOR (GAMES)
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Nancy Durlester DIR. OF CENTRAL SERVICES
Richie Lesovoy PRODUCTION DIRECTOR

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30 Monmouth St., Bath, Avon, BA1 2BW, England
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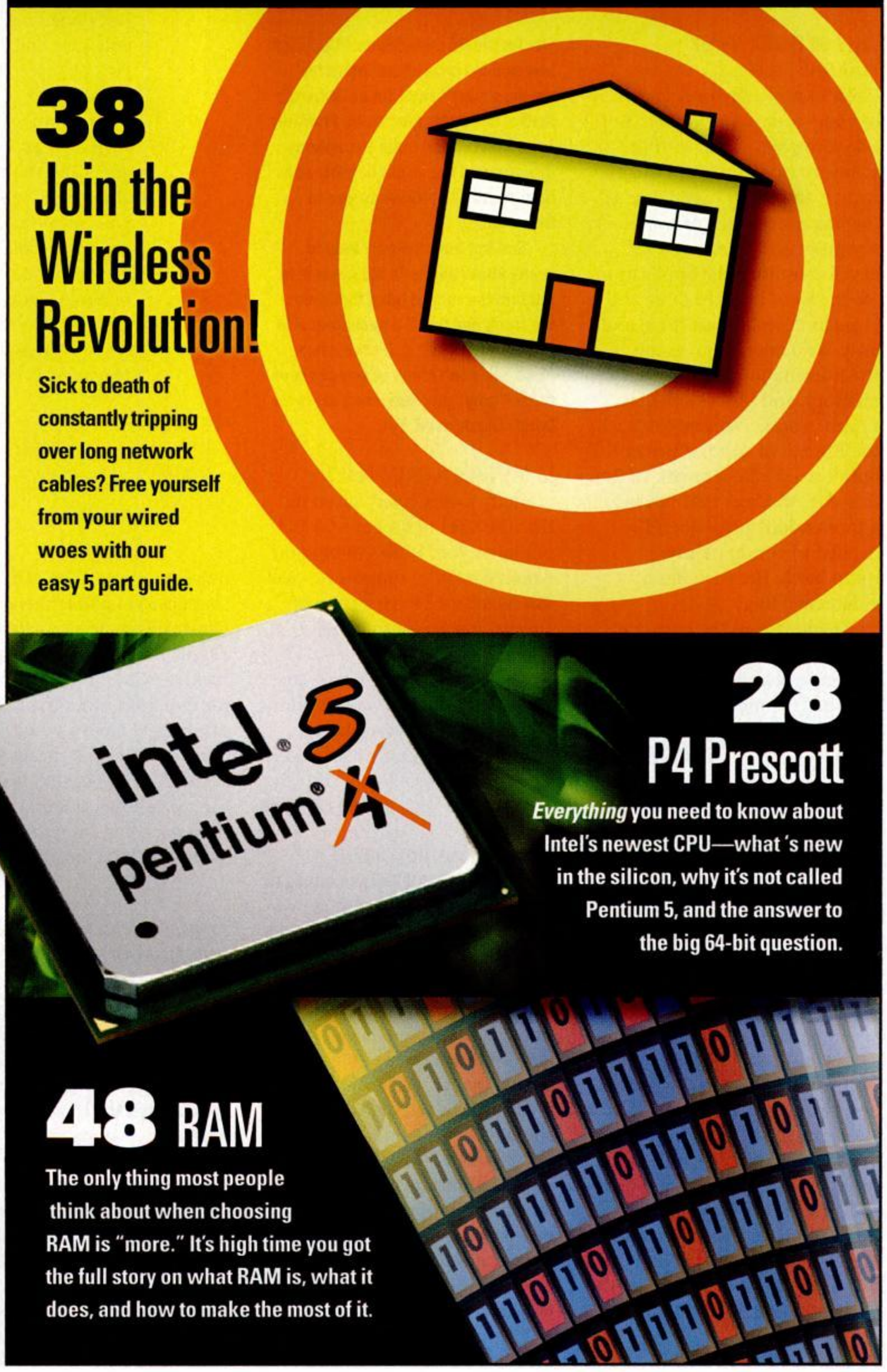
Contents

MARCH FEATURES


38
Join the Wireless Revolution!
Sick to death of constantly tripping over long network cables? Free yourself from your wired woes with our easy 5 part guide.
28
P4 Prescott
Everything you need to know about Intel's newest CPU—what 's new in the silicon, why it's not called Pentium 5, and the answer to the big 64-bit question.
48 RAM
The only thing most people think about when choosing RAM is "more." It's high time you got the full story on what RAM is, what it does, and how to make the most of it.

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In/Out

You write, we respond

WHY 98 PERCENT OF YOU ARE MEN

I don't know why only 2 percent of your readers are women, but I do know why I fall into the minority category. I'm not a gamer, and I don't strip down my box every week or overclock my processor. I do, however, develop multimedia applications for the web. I looked at all the popular PC mags out there and only *Maximum PC* gives me the information on hardware, memory, and processors that I need. Adobe *Premiere* can suck the life out of sub-par systems. I didn't need a benchmark to find this out. *Maximum PC* has been a tremendous help when I've needed to configure my rig to battle the trenches of video encoding.

Thanks for all the help, and for not including feminine hygiene ads in your magazine. I have all the information I need on those.

—JENNIFER KANG

IS IT LEGAL TO BUY MP3 FILES FROM ANOTHER COUNTRY?

Kudos on the very informative "Know Your Digital Rights" (February 2004). This article cleared up a lot of grey areas for me and is surely a keeper. I was surprised, however, that you didn't cover a new controversy with digital rights: buying MP3s from another country. Recently, sites like the Russian **allofmp3.com** are making big bucks by "exporting" MP3 files to users for as little as 1 cent/MB. They seem to be "in the clear" in their own countries, but I would love to hear your legal experts' opinions on whether this is legal for U.S. buyers to use.

—CHRISTOPHER MASELLI

PC RIGHTS AUTHOR JASON COMPTON RESPONDS:
Unfortunately, you can commit copyright infringement under the law even if you think your actions are legit, such as paying an unlicensed site for music downloads. "Copyright law doesn't care about intent for the most part," says Jason Schultz, staff attorney for Electronic Frontier Foundation. "The main exceptions are criminal copyright liability and how much you pay when you're found guilty."

Sad but true, the only way to really know you're in the clear is to contact the record label that owns the track and ask if a particular site is licensed to sell it. On the other hand, we don't know of any users of these "grey" pay services who have been subpoenaed. Yet.

IS MY SON A CRIMINAL?

A buddy just pointed out to me that the CFO of EA makes $23.1 million a year. Who's ripping off whom here? I'm supposed to feel like a crook if I burn a copy of a game and give it to a friend? I don't think so.

That issue aside, I'd love to know what the legal ramifications of having my 10-year-old son accept the EULA for every piece of software I install.

—THE SKULKER

PC RIGHTS AUTHOR JASON COMPTON RESPONDS: According to Ross Kodner, president of MicroLaw Inc, "A 10-year-old is not considered competent to enter into contracts without parental consent (evidenced in writing)." However, if you buy the software and commission your son to install it, then it could be argued he is acting as your authorized agent, or is acting under your supervision and approval.

Says EFF's Schultz, "Contract law varies from state to state, though, so the answer might also depend on where you live. In addition, there are lots of problems with EULAs, and even some question as to whether they are real contracts."

WHITHER DOLBY DIGITAL DECODING?

I'd love to commend you for a great magazine. It's the only thing I ever look forward to in the mail these days. I have a quick question: Why is it that soundcard manufacturers like Creative Labs don't include Dolby Digital Decoding output and only include PCM on their soundcards for functions other than DVD playback? I have a $1,200 receiver with nine speakers and a subwoofer, and I don't need the 5.1 speaker rigs. It stinks to not have decoding support for EAX games over the optical/RAC out.

—JOSEPH LEVY

SENIOR EDITOR GORDON MAH UNG RESPONDS: This isn't just a Creative Labs issue. Most of the soundcards and motherboards on the market with SPDIF outputs (optical or coax) do not support encoding Dolby Digital streams. In the old days, the issue was computing power—unless the DSP on the soundcard could do the encoding, it would have to occur in your CPU. In the 500MHz Pentium III days, you could probably watch a DVD and nothing else. Today, even though there's a wealth of CPU cycles, few do host-based Dolby Digital encoding. I suspect it's because the companies don't want to pay Dolby any more money. nVidia is currently the only company we know of to offer a hardware-based encoder in its nForce2 chipset. All is not lost, though. C-Media is supposed to offer a host-based encoder on its AC97 chips. We haven't seen a motherboard with this feature yet, but C-Media continues to claim it has the capability.

WINDOWS XP TIPS CONTEST RESPONSES

The best damn tip for Windows XP: Subscribe to *Maximum PC*, where you will find everything you need to know.

—DANNY CHAVIRA

Unlike many of the other tips that *Maximum PC publishes*, this tip won't optimize your PC's performance or tweak a particular setting. Instead, it will create a console of frequently used applications, folders, and web sites and put it constantly at your fingertips, resulting in an ordered and clutter-free desktop.

To begin, create a folder on your desktop named something fitting like "Shortcuts" and fill it with the shortcuts you'll want to frequently access. I put applications, documents, and files in mine. Close the folder, click on it and drag it to the edge of the desktop screen. It will transform into a taskbar that can be manipulated similarly to the taskbar at the bottom of your screen. To hide the folder

YOU'RE WELCOME—CAN WE RIDE IN THE BLACKHAWK?

Just e-mailing you guys and girls to say thanks for putting out such a great magazine month after month. I've been here in Iraq for about nine months, and I think I would go crazy without your great reading material. Your magazine keeps me and my fellow soldiers up to date on the latest and greatest PCs, gadgets, and other cool stuff. I'm also sending you a picture of one of the coolest aircraft in the U.S. military: the Blackhawk. It's like riding a roller coaster, only faster!!! Anyway, thanks once again from all the soldiers, and your magazine is truly KICK ASS.

FROM TIKRIT-IRAQ,
—PFC LUCIANO REBOUCAS

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on your Desktop, right-click the original folder, choose Properties, and check the Hidden option. You can add folders to your main folder to organize your shortcuts or resize the taskbar like you would any other window. If you enable the Always On Top option, you will create a frame for all of your non–full screen applications like *Word* and *Internet Explorer*.

With this tip, My Documents, my games folder, all my favorite sites, and my school folder are all just a click away.

—NICK EDWARDS

EDITOR IN CHIEF GEORGE JONES RESPONDS: This is literally .001 percent of the total number of Windows XP tips we received from readers in response to our February "Energize Windows" cover story contest. We'll announce two winners next month in our April issue, at which point the winners receive either an Audigy 2 ZS Gamer soundcard or an ATI Radeon 9600XT. If you don't know what I'm talking about, shame on you for not reading the February issue!

HOW COULD YOU DIS GIGAWORKS?

In your review of Creative Labs S750 Gigaworks speakers (February), you said the subwoofer wasn't powerful enough. My question is this: Did you thoroughly test the subwoofer? I recently read a review on the web stating that the S750 subwoofer is the best subwoofer they'd ever tested, and that it had the best range of negative and positive decibels. In fact, the reviewers had to completely change how they graded speakers because the S750 kicked so much butt. I grabbed a pair of these myself and have already cracked two windows with the subwoofer. How can you say it's not powerful enough?

—ANDY KITZKE

DISC PRODUCER JOSH NOREM REPLIES: Andy, you're not the first person to disagree with our assessment of the Gigaworks speakers, but we stand by our review. We're unable to explain the differences between our review and the one you read online simply because everyone has their own criteria for testing speakers. All we can do is report on what we experienced during our extensive testing. We tested the speakers every night for two weeks straight by playing games, watching movies, and listening to music. We even went out and bought 6.1 DVDs just to see how they sounded. This was all done in addition to our standard testing regimen, which involves running a battery of test signals. While we found the S750 to be an excellent speaker set, we just couldn't get past the flimsy control pod and the subwoofer's tendency to belch when pushed to the maximum levels. ■

"EFFECTIVE CLOCK SPEED IS JUST A MARKETING NUMBER HARDWARE VENDORS USE TO TRICK POORLY EDUCATED CONSUMERS."

TELLING IT LIKE IT IS

In your review of the ATI Radeon 9600 XT ["Budget 3D Card Bustup," January 2003], you said the card has a 300MHz 128-bit DDR memory configuration, but ATI's web site disagrees. The web site says the card has 600MHz 128-bit DDR. This would come out to 9600MB/sec, or 9.6GB. In your article, you even said the card puts out 9.6GB/sec. But if the card were 300MHz, the card would be putting out 4.8GB/sec. What is the actual clock speed of the memory?

—ANDREW NOYES

TECHNICAL EDITOR WILL SMITH RESPONDS: The actual clock speed of the card's memory is 300MHz. The ATI web site lists the "effective clock speed" of the memory as if it were single data rate memory. Because the 9600 XT (and most other modern videocards) use DDR memory, it can transfer two chunks of data every clock cycle. At *Maximum PC*, we always report the actual clock speed of the system's memory, because it is the clock speed of the RAM. Effective clock speed is just another marketing number hardware vendors use to trick poorly educated consumers (who don't read *Maximum PC*) into buying inferior hardware.

LETTERS POLICY: ***MAXIMUM PC*** invites your thoughts and comments. Send them to **input@maximumpc.com**. Please include your full name, town, and telephone number, and limit your letter to 300 words. Letters may be edited for space and clarity. Due to the vast amount of e-mail we receive, we cannot personally respond to each letter.

CUT, COPY, PASTE

➤ We goofed in our February "Plug 'n' Connector Reference" guide. Image shifting and last-second edits created some chaos in the layout, as more than a few readers pointed out. To wit: The connector labeled "Serial RS-232" is actually a DB-15 VGA connector. Ouch. The connector labeled "5-pin powered mini USB cable" was actually a standard 5-pin USB cable. Argh. The connector labeled "CD Audio" was actually an MPC cable for analog audio. Grrr. And the connectors labeled "3.3v" and "5v" actually deliver both voltages. It won't happen again. We swear.

➤ In our February issue cover story ("Energize Windows"), we mistakenly cited the URL for the videocard overclocking utility *Powerstrip*. The correct address is www.entechtaiwan.com.

➤ There were two errors in the February review of the Sapphire Radeon 9800 XT. The board does indeed come with a *Half-Life 2* coupon that can be redeemed for a full version of the game whenever it ships. The correct URL for Sapphire is www.sapphiretech.com .

COMING NEXT MONTH

IN THE *CAVIAR DREAMS AND CHAMPAGNE WISHES* APRIL ISSUE OF *MAXIMUM PC*

THE ULTIMATE DO IT YOURSELF GUIDE

As you read this, we're racking our brains to come up with 20+ amazing DIY projects for you. You can't afford to miss this story!

HIGH-END NOTEBOOK ROUNDUP

We're ensconced in high-powered laptops. All of them claim to be the best, but only one will emerge triumphant.

GOOGLE: BEHIND THE SCENES

What happens between the moment you press "Search" and the near instantaneous delivery of hundreds of results? A whole lot, as it turns out. We'll deliver the scoop in classic *Maximum PC* fashion!

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No:12 / January 2004
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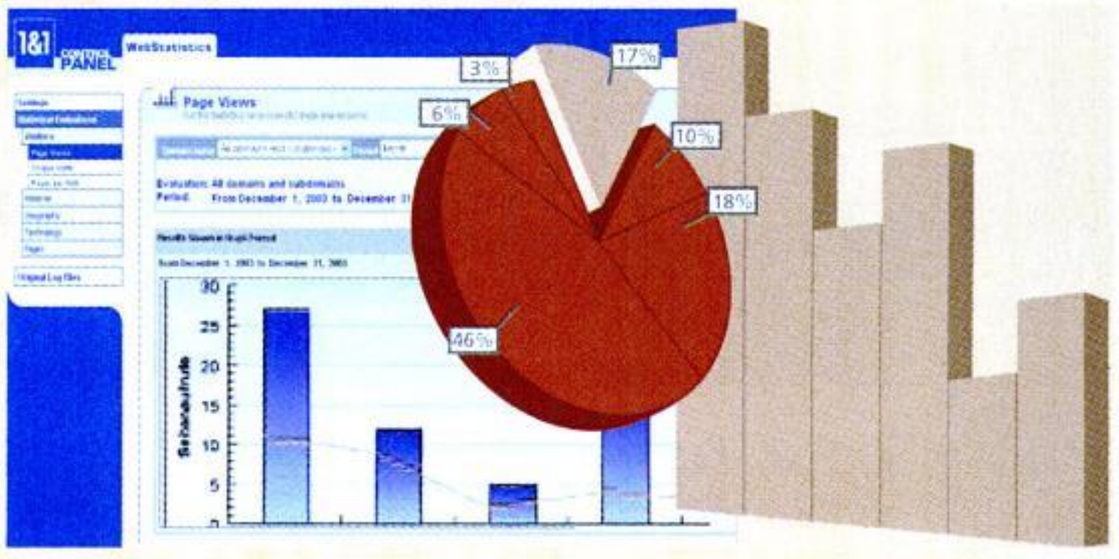

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- 1&1 Control Panel

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- 1&1 WebMail
- Virus scanner for 6 POP3 accounts

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- FrontPage 2002 extensions
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Quick Start

The beginning of the magazine, where articles are small

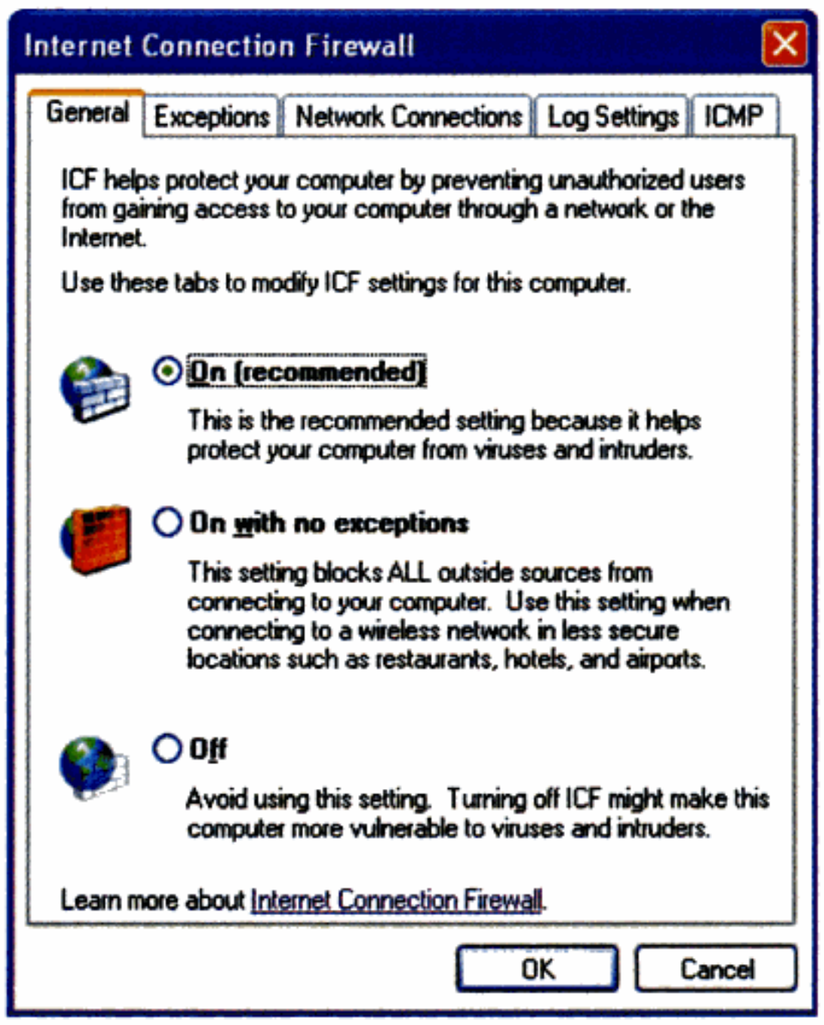
Windows XP Service Pack 2 Improves Security, Wireless, and more!

We take an early look at Win XP's biggest update yet and come away impressed with its enhanced security—and decreased annoyances

Microsoft is putting the finishing touches on a massive update for Windows XP that addresses numerous security concerns, Wi-Fi connectivity, *Internet Explorer*, and even 64-bit computing.

At press time, SP2 Beta was being tested by registered Microsoft developers for potential release in July. We got our hands on that same beta and what we saw impressed us. Here are six reasons why we'll be lining up to update Windows XP on day one of SP2's release.

Read 'em and weep hot tears of joy.


Internet Connection Firewall
General
Exceptions
Network Connections
Log Settings
ICMP
ICF helps protect your computer by preventing unauthorized users from gaining access to your computer through a network or the Internet.
Use these tabs to modify ICF settings for this computer.
On (recommended)
This is the recommended setting because it helps protect your computer from viruses and intruders.
On with no exceptions
This setting blocks ALL outside sources from connecting to your computer. Use this setting when connecting to a wireless network in less secure locations such as restaurants, hotels, and airports.
Off
Avoid using this setting. Turning off ICF might make this computer more vulnerable to viruses and intruders.
Learn more about Internet Connection Firewall.
OK
Cancel

Windows XP Service Pack 2 aims to prove that Microsoft gives a hoot about security by upgrading the existing basic firewall to a highly configurable one.

1 Messenger service is now off. Microsoft's insidious Messenger service, intended for network admins but most commonly known for allowing "UNIVERSITY DIPLOMA" pop-up spam, will be turned off by default.

2 A more powerful and configurable firewall. In SP2, Windows firewall utilizes a more interactive interface and now asks permit-or-deny questions about programs making unauthorized network connections. The firewall also runs during boot-up. Service Pack 1's firewall doesn't, which leaves a gap of vulnerability between the time your PC comes alive and the firewall service kicks in.

3 Improved Internet Explorer. For the first time in ages, Microsoft is substantially improving *IE*. The most significant additions are a built-in pop-up blocker and a "Manage Add-Ons" screen that lets you examine the third-party code modules that have integrated themselves with your browser. Troublesome modules (read: spyware) can be disabled, and *IE* now tracks crashes more carefully to help programmers debug problems. Furthermore, modules should have a harder time integrating themselves with *IE* without your knowledge or permission.

4 Simpler and more convenient Wi-Fi access. Win XP's wireless LAN client gets a new, streamlined look. The original version becomes hard to manage as Windows discovers and keeps track of more than a few access point configurations. Microsoft has also preconfigured hotspot profiles to make logging into various national services like T-Mobile easier. An Automatic Connection feature allows you to easily hook into your preferred networks whenever they're in range. Finally, Bluetooth now works better for simple connections like keyboards, mice, and PDA links, and shouldn't require external software to activate.

5 Local content zone lockouts. *Internet Explorer* will be more cautious about the permissions it gives to HTML files considered part of the "local content" zone. In the past, tricksters have loaded malicious code that never would've gotten through your web connection to your hard drive and prompted the browser to open the code from there. ActiveX and similar functions will be disabled by default for such local files, making it harder to obtain and execute web Trojans.

6 Numerous internal changes. While SP2 also incorporates a slew of internal changes that mostly affect developers, one change we're closely watching is Execution Protection. This should help keep your programs running more smoothly in 64-bit or hybrid 32/64-bit environments. Given the very real potential for instability when 32- and 64-bit drivers mix, as well as the potential for certain 64-bit applications to crash when running on a system with huge memory capacities, Execution Protection may turn out to be one of the major perks for power users in SP2.

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ALT.OPINION.RANTS BY JON PHILLIPS

When CPU Names Attack

It boggles the mind: The very same company that engineers some of the world's most sophisticated technology is now releasing "nomenclature madness" upon the teeming geek masses. If you've already read the CPU report on page 28, you know I'm referring to Intel and its current Pentium 4 lineup.

Here's the short story: Some P4s are based on the Northwood core. Others are based on the Prescott core. Some P4s run on a 533MHz bus. Others run on an 800MHz bus. Some P4s have 2MB of L3 cache. Others have no L3 cache at all. Hyper-Threading support? You'd think all the new Prescott-based P4s would include it. But the 2.8GHz P4s do not.

Interested in buying a 3.4GHz P4? You better know exactly which one you're looking for and how it's designated by special notation, because Intel is selling three different 3.4GHz CPUs bearing the Pentium 4 pedigree.

Now, if you're a witless newbie, ignorance is bliss. Concerns about system bus speeds and core architecture don't keep you up at night, so you don't need to know any spec details about the P4 you're about to purchase. You can simply buy a new PC armed with some type of P4 and comfortably assume that faster clock speeds are better. However, if you build your own systems, or get your jollies from swapping new processors for old, you are most certainly concerned with your P4's precise hardware profile—and Intel's current letter-based naming convention doesn't do much to explain which CPUs include which features.

One can only imagine the confusion that will reign on Internet message boards as enthusiasts wax eloquent: Some schmuck in Tarzana mistakenly identifies a 2.8B as a 2.8A, innocently mistyping just a single letter, and chaos erupts. What could have been a fleeting, three-message thread suddenly becomes one of those eight-page-long uber-threads. And all because Intel eschewed an accessible naming structure precisely when its products are at their most complex and varied.

Can you imagine walking into a supermarket and attempting to choose between Ritz Bits A and Ritz Bits B? Of course not. That's because the rest of the world's product manufacturers use descriptive naming conventions to curtail consumer confusion.

Now here's the good news: An Intel rep told me the company might soon look at a more "end-user friendly" naming system, and also pointed out that all Intel CPUs can be immediately IDed by their "sSpec" number (see Intel's web site for details). Even better, all retail P4 boxes clearly note bus speed, cache amount, and socket support. So even if you do find yourself miscommunicating with other PC enthusiasts, buying the wrong CPU out of confusion need not be a fait accompli.

Jon Phillips was formerly editor-in-chief of Maximum PC, *and now serves as the magazine's editorial director.*

30-Second White Paper

This Month: Why don't more games and software come on DVD?

Q: Many games come on three or four CD-ROMs these days. Why aren't they shipped on DVD-ROMs instead?

A: Our initial guess was that the price of DVD production is more expensive. However, research indicates that it's actually cheaper to manufacture and ship a single DVD-ROM instead of four CD-ROMs.

Our second guess was that not all gamers have a DVD-ROM drive. Ubisoft's *XIII* and *Beyond Good and Evil* are both epic-scale games that come on multiple CDs, so we trotted out the question to Tony Kee, Ubisoft's vice president of marketing. Kee confirmed that our second answer was right: Drive compatibility still has most game companies spooked.

"Our research indicates that DVD-only releases would currently eliminate a larger-than-acceptable portion of our target market," Kee explained. "Many PCs still have CD-ROM-only drives, and also, as opposed to opting for DVD drives, many new consumers last year opted for CD-RW drives, which don't play DVDs either. Every year, the percentage of people who cannot play a DVD on their computers will shrink as more and more get DVD drives, and eventually we will feel comfortable that most of our target can play a DVD. That's when we'll go DVD on PC games." From our perspective, that day won't come a minute too soon.

The sooner everyone buys a DVD-ROM drive, the sooner we'll all be rid of multi-CD game installs.

FUN-SIZE NEWS

NOW THAT'S FORCE FEEDBACK

No longer will gamers have to make the dreaded decision: *Knights of the Old Republic* or the gym? At least, not with the kiloWatt game controller around. "Controlling video gameplay with kiloWatt is very entertaining and physically demanding," says manufacturer Powergrid Fitness (**www.powergridfitness.com**). A shoulder-height "resistance rod" (no snickering, please) measures the force applied to the rod and translates it into standard joystick data, while the gamer apparently bulks up from the workout of stabilizing the rod. Or so they say. Throw out the Bowflex, bub, the kiloWatt controller should be available by mid-year for $695.

Next-gen snowboard? Canine trainer? Marital aid? Think again...

DOUBLE YOUR DVD PLEASURE

Kano Technologies recently announced the first double-sided recordable DVD media for home use. Kano is calling it ArchivMedia, but you'll more likely see it on shelves under the Verbatim brand as "DS DVD+R." The total capacity of the disc will be 9.4GB, but you will, of course, have to "flip the burger" to access data on the other side.

INTEL GOES HI-FI AUDIO

Intel's next-generation audio specification, previously code-named Azalia, has been officially coined "Intel High Definition Audio." The increased bandwidth allotted by the new spec permits 192kHz, 32-bit multichannel audio. Intel's HDA also integrates Dolby's Pro Logic IIx technology, which generates 6.1- and 7.1-channel output from a 5.1-channel signal. Look for HDA on Grantsdale chipsets by mid-year.

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Mod Your iPod

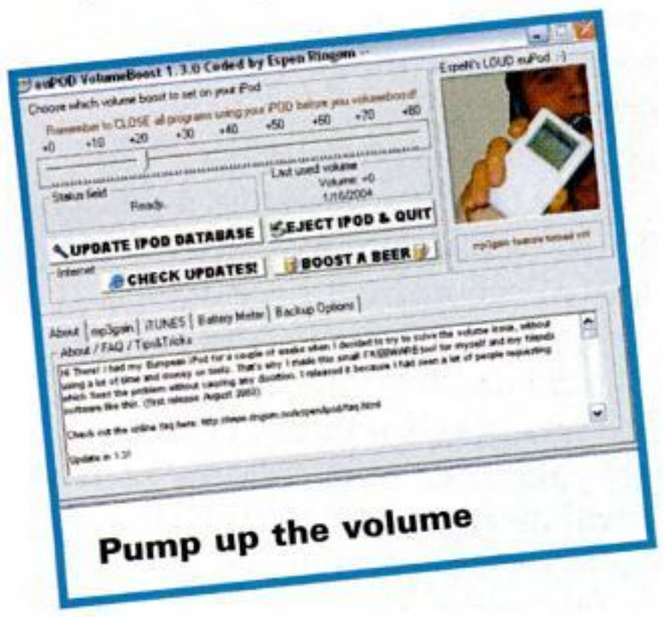
Three cool hacks to get the most out of your MP3 player

Have you been feeling like your iPod and *iTunes* are a little too uptight? We dug up a few hacks that offer workarounds and tweaks to some of the more restrictive aspects of our favorite MP3 player and its accompanying software.

But remember, these are hacks, and hacks can easily go awry. Before applying any of them, make sure you back up the tracks on your iPod via *MusicMatch* or *iTunes*. If your iPod hangs, first try a reset (hold down the Play and Menu buttons at the same time for about 5 to 10 seconds). In the rare event that this doesn't work, just leave your iPod on until the battery runs out, then attach it to your PC again. The reconnect should wake up your comatose player.

Increase your iPod's volume

Some MP3s are recorded at annoyingly low levels, and European iPods actually have their overall volume level restricted. *euPOD VolumeBoost 1.3.0* (**www.ringom.no/espen/ipod/**) was designed as a workaround to the latter, but will work with any tracks on any iPod. Download it from the link above, and connect your iPod to your PC. Unzip *euPOD* to a folder, and launch the executable. Once it finds your iPod, you'll see a slider that goes from +0 to +80. Your iPod's baseline volume is +0. Every increment above that raises the volume level of the tracks in your iPod without affecting any of the original files.



Pump up the volume

Drag tracks off your iPod

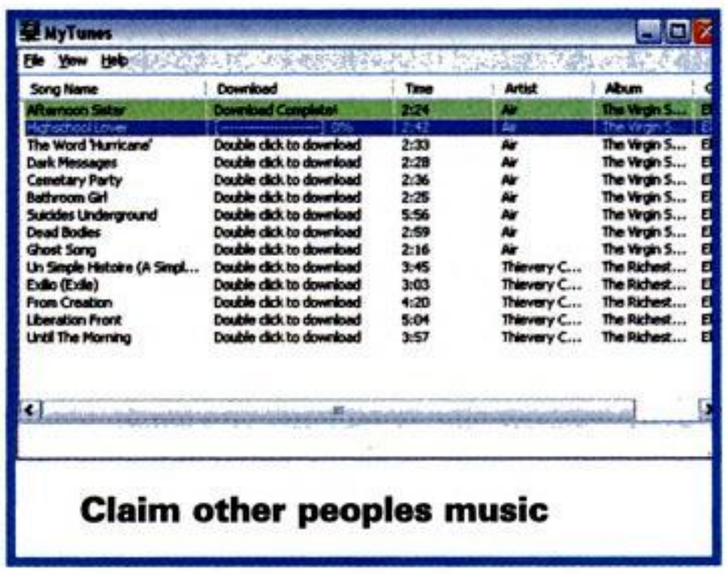
iTunes won't let you download music from your iPod back to your PC, because, as we all know, that's the most popular method of file sharing. Let's see if we can't fix that.

Go to **www.kennettnet.co.uk/software/podutil.php** and download *PodUtil 2.0*. Unzip the file to a folder, launch the executable, and give it a few minutes to inspect your iPod's contents, after which the program screen should pop up. Click the Copier tab: This allows you to download your iPod's contents to anyplace on your hard drive. Just make sure you've got enough room first; the Basic option under "Copy Mode" will tell you how much room you will need.

Reclaim your music

Share music with iTunes

iTunes is nice enough to permit streaming of other folks' music over a network, but it draws the line at letting you copy these tracks to your PC. *MyTunes* let's you move that line in the right direction. Download *MyTunes* from **http://mytunes.linu.cx** (be patient —the server gets overloaded often). Launch *iTunes* first, and then *MyTunes*. Peruse a shared folder on the network, and every time you double-click a file to play it, that file will also appear in *MyTunes*. Double-click it there as well to download the track. The default download folder can be changed under the View menu.


MyTunes
File View Help
Song Name | Download | Time | Artist | Album
Afternoon Sister | Download Complete! | 2:24 | Air | The Virgin S...
The Word 'Hurricane' | Double click to download | 2:33 | Air | The Virgin S...
Dark Messages | Double click to download | 2:28 | Air | The Virgin S...
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Bathroom Girl | Double click to download | 2:25 | Air | The Virgin S...
Suicides Underground | Double click to download | 5:56 | Air | The Virgin S...
Dead Bodies | Double click to download | 2:59 | Air | The Virgin S...
Ghost Song | Double click to download | 2:16 | Air | The Virgin S...
Un Simple Histoire (A Simpl... | Double click to download | 3:45 | Thievery C... | The Richest...
Exilio (Exile) | Double click to download | 3:03 | Thievery C... | The Richest...
From Creation | Double click to download | 4:20 | Thievery C... | The Richest...
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Until The Morning | Double click to download | 3:57 | Thievery C... | The Richest...

Claim other peoples music

FAST FORWARD BY TOM R. HALFHILL

Digital Eyes Everywhere

Digital cameras are changing photography and everyday life in ways we never imagined. Yes, we know that memory cards are replacing film and that inkjet printers are replacing darkrooms. What we didn't expect is that, when wielded by ordinary people, digicams would make surveillance photography a universal phenomenon. This sets photography on a collision course with privacy rights and terrorism hysteria.

It will soon be possible to surreptitiously photograph anything, anywhere. Digicams can be extremely small—smaller than all but the most exotic film cameras—and incredibly inexpensive. For little additional cost, a digicam can be added to another digital device, such as a cellphone or PDA, that already has the microprocessor and memory required to support image capture. More than 170 million camera phones are expected to be sold worldwide by 2006. I've also seen digital cameras disguised as jewelry and all sorts of common objects. So what happens when everybody can carry an unobtrusive or hidden camera?

One result: candid pictures of people in public restrooms, health-club showers, clothing-store changing rooms, and other private places. Some digicams have infrared-sensitive sensors; with a special filter, they can produce revealing images of women in wet bathing suits. In California, a man was recently busted while taking pictures of women's crotches with a tiny digicam hidden in his shoe. One manufacturer has even banned its own camera phones from its very own factories in order to protect trade secrets.

Meanwhile, cameras that are identifiable as cameras are facing more obstacles in public places. Security guards have harassed people for taking snapshots of the Golden Gate Bridge in San Francisco, worried that terrorists posing as tourists might be studying the bridge's construction. A few steps away, hundreds of books filled with pictures of the bridge are available in the gift shop. How will such witless authorities cope with millions of nearly invisible cameras? Not very well, I'm afraid.

Ironically, governments and businesses are installing literally millions of video surveillance cameras in public areas, intersections, stores, and workplaces. They want to stare at us, but they don't want us to stare back.

Watch out for a backlash against phone cameras and other inconspicuous digicams. When fast film liberated cameras from tripods in the late 1800s, photography changed from a static art that imitated painting into a new visual art of real-life reportage.

Tom Halfhill was formerly a senior editor for Byte *magazine and now an analyst for* Microprocessor Report.

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GAME THEORY BY THOMAS L. McDONALD

No Choices Equals No Fun

Choice is at the very heart of Eidos' first-person RPG *Deus Ex: Invisible War*, and in many ways, this is the game's very undoing. In the interactive medium, when the consequences of our choices don't have an impact, it's hard to feel joy, pain, or much of anything.

Much has been made about the lack of an overtly good or evil side in *Invisible War's* struggle. Gamers who have gotten most excited about this ambiguity are those who believe that moral relativism is a desirable philosophy of life rather than the absence of one. The story paints a struggle between predatory capitalism and religious fanaticism in shades of gray that give equal weight to both sides. I would argue that even the most predatory capitalism produces jobs and goods, whereas religious fanaticism produces only corpses. Others would argue differently.

Whatever your feelings, this setup initially makes for a paranoid and tension-filled atmosphere. Warren Spector and the game's cadre of designers should certainly be applauded for attempting to enrich the gaming experience by introducing such narrative complexity, even if the story's tensions and branches become a muddle of sometimes-confusing morals and motivations.

The holes in the story normally would be of little concern. After all, what game doesn't suffer from plot holes? However, by over-simplifying the complex and interesting gameplay elements featured in the first *Deus Ex*, Ion Storm's designers have unfortunately shifted gamers' focus away from tangibly rewarding play mechanics and more towards narrative.

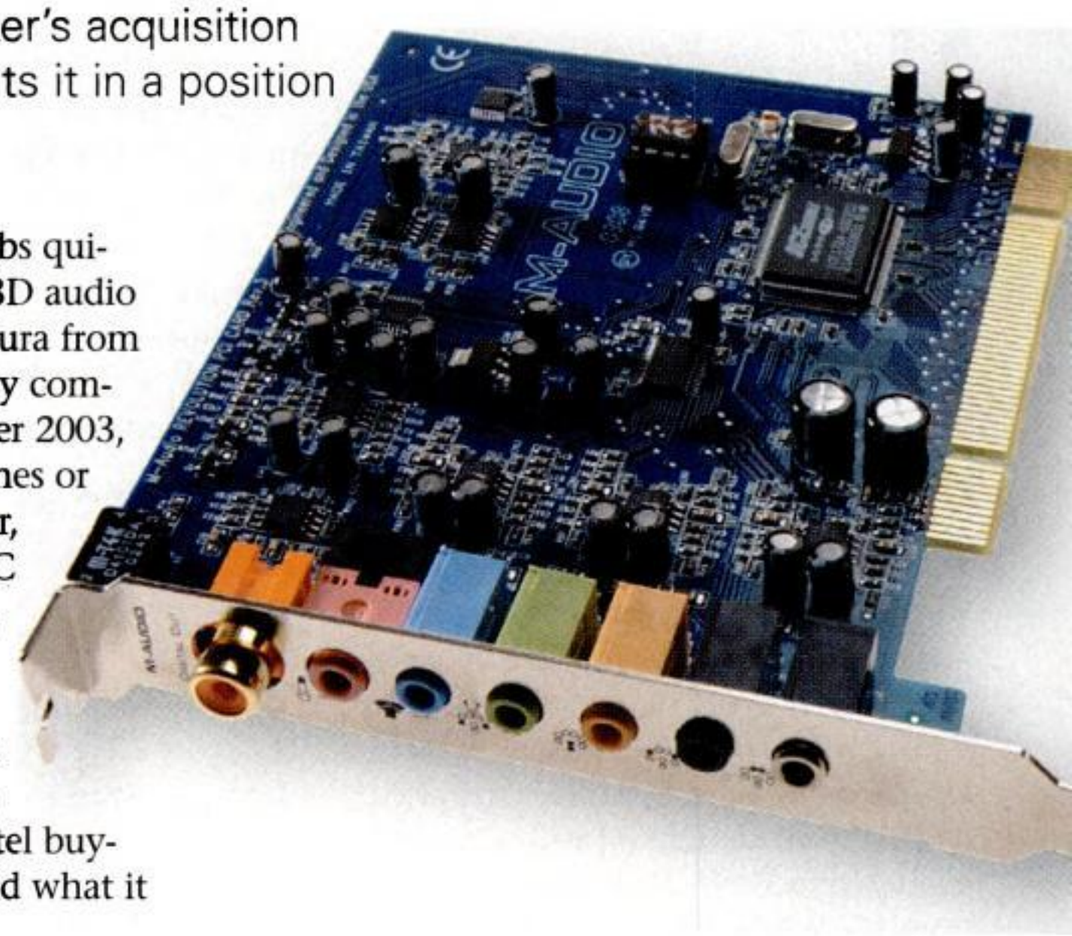
I'm not sure this was the right direction for the series to take. The original *Deus Ex* had a remarkably satisfying skill system and RPG vibe that complemented and embellished what was a flawed but similarly open-ended story. *Invisible War* foregoes this gameplay complexity with a greatly reduced and far less appealing system of biomods. With only five biomod slots (all of which can be filled within a few hours) and a single type of ammunition, the RPG elements PC gamers drooled over have been stripped bare.

What's left is a game of decision-making: which side to fight for, what path to take, what missions to accept, and whether to use stealth or violence to complete your objectives. If there is a system of consequences and rewards for your decisions, however, I'm missing it. Other than warm, fuzzy satisfaction, moving past obstacles by stealth rather than murder seems to bring no appreciable reward, and the factions all seem willing to give you one more chance when you blow a task. The only consequence, it would seem, is the one your imagination manufactures, and that's a shame.

Tom McDonald has been covering games for countless magazines and newspapers for years. He lives in the New Jersey Pine Barrens.

Creative Labs Quietly Makes Big Waves

The soundcard maker's acquisition of rival Sensaura puts it in a position of dominance



When Creative Labs quietly purchased 3D audio developer Sensaura from London-based technology company Scipher in December 2003, there were no big headlines or Internet chatter. However, on the Richter scale of PC audio business strategies, the acquisition feels like an 8.0. Relatively speaking, the acquisition is nearly as significant as ATI buying nVidia, or Intel buying AMD. Here's why, and what it means for you.

Who the hell is Sensaura?

A small English company, Sensaura develops and licenses several 3D audio technologies. In the PC, the Sensaura engine—an underlying proprietary algorithm used to render 3D audio—powers about 95 percent of the motherboards and notebooks on the market, including the vast majority of consumer soundcards not made by Creative Labs.

Why did Creative Labs snatch up Sensaura?

Steve Erickson, Creative Labs' general manager for desktop audio, told *Maximum PC* that Creative shelled out $5.6 million to buy Sensaura for a number of reasons, including access to a strong audio development tool that works across game consoles and the PC. Erickson also said Sensaura has connections with many consumer electronic devices as well as the mobile market—two categories Creative would like to enter. Creative, of course, also doesn't mind gaining the company's audio-oriented intellectual properties, which include its two-speaker spatializer technology and its realistic-sounding headphone algorithms.

"We're still in the process of figuring out what the right business model is," Erickson said. Creative continues to work with all the companies who currently license Sensaura's technology and has no plans to pull the rug out from under companies that are direct competitors.

What does it all mean for you?

In the short term, Creative says it plans on changing nothing. You'll still be able to get a VIA-based or RealTek-Media motherboard with the Sensaura engine. The thorny question is, What happens in the long run? Competing hardware vendors we spoke with gave mixed reviews of the deal. One vendor said the deal can only lead to one result: Creative's competitors will lose the ability to license Sensaura products.

These critics point to Creative Labs' history of vaporizing its conquests, including EMU, Ensoniq, and Aureal. "Given the track record [of Creative], the company will wait until everyone forgets, and then next year, the hammer will drop," said the vendor, who asked to remain anonymous.

With Creative now controlling the intellectual property of both Sensaura and Aureal, as well as its own large portfolio, building a competitive engine without infringing on Creative's copyrights is going to be legally challenging, the vendor said. "The difficulty is not in making [the technology], the difficulty is making it without getting sued." If Creative were to restrict access to Sensaura's technology, many companies, including Intel, might simply decide to get out of the business rather than develop their own.

If this happens, we'll all be using Creative's products in the future. And there won't be a damn thing we can do about it.

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NP5680 FEATURES

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TechnoFile

Quick takes on technology trends

THIS MONTH: Futuristic Gear and Components

Is this the future? We dare you to take a look at this collection of innovative, forward-thinking products and say otherwise!

The OQO uPC

OK, so we recently made fun of OQO's three years of vaporware announcements for its upcoming handheld ultra personal computer, dubbed the uPC. Well, the device finally made a flesh-and-blood appearance at this year's Consumer Electronics Show (CES), and try as we might, we found ourselves unable to ridicule it. We were surprised to find a very nice touch added to the prototype—the uPC's screen slides up to reveal a handy keyboard, with a pointing stick and two mouse buttons embedded in the face. Current specs are: a 1GHz proc, a 20GB hard drive, 256MB RAM, and built-in Wi-Fi, all powered by a removable lithium-polymer battery. The new launch date is the "second half of 2004." We're not holding our breath, but OQO has our attention.

4GB, .85 inch hard drive

The introduction of Toshiba's tiny hard drives may end, once and for all, the debate about hard drive versus flash memory–based portable audio and video players. 4GB can handle the MP3 load necessary for the trip to and from Burning Man, or provide you with enough storage for five feature-length movies in an acceptable resolution for any portable device. Need we say more? Mass production begins this spring—expect devices using Toshiba's mini-wonder by the third quarter of 2004.

Smart Personal Objects Technology

We like the idea of "glanceable" technology—unobtrusive devices that subtly transmit information that can be comprehended at a glance. Microsoft's Smart Personal Objects Technology (SPOT) initiative is pushing the concept forward, beginning with Smart Watches that can display customized information about your appointments, news, sports scores, or whatever it is that you want to know, on a small LCD screen. Unfortunately, it doesn't help that the watches are huge, goofy-looking, require a subscription service, and like most electronic devices, must be turned off during takeoff and landing. We remain skeptical.

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Creative Portable Media Center

In his book *The Tipping Point*, Malcolm Gladwell explains how a simple concept becomes an epidemic word-of-mouth phenomenon. Creative Labs' Zen Portable Media Center may be the "tipping point" for portable video. Based on Microsoft's Portable Media Center OS, Creative Labs' device is extremely light, with a bright, sharp display in a casing that can be easily held in one hand and stored in a back pocket. Scheduled for release "later this year," we've heard no official word on the maximum resolution of the device. Nor do we know much about what kind of digital rights management the Zen Portable Media Center will impose on users.

Eyetop Centra Portable Display

This year's Consumer Electronics Show brought us our first hands-on demonstration of Eyetop's Centra Display (**www.eyetop.net**). We were devastated by its coolness. One side of the not-as-silly-as-you-might-expect glasses have an embedded projector that casts a floating 320x240 display onto the lens of one of your eyeballs. Pictured is the original Eyetop design—the company was extremely uptight about letting us photograph the new Centra model as it was a prototype. Expect it this spring for around $400.

Dual-Layer Recording

Waiting for Blu-Ray optical disc recorders? Don't bother. They're still a "boutique" item with little to offer the average Joe in terms of usefulness or affordability. But dual-layer recording? Now you're talking. Burners that can write to both a semitransparent and an opaque layer on a single disc have been demonstrated using both major recordable DVD formats (DVD+R and DVD-R) at speeds up to 2.4x. Verbatim plans to launch dual-layer media by the end of spring. Pioneer has hinted that dual-layer burning to DVD-R may be possible with only a firmware upgrade, but we'll believe that when we see it.

Fanless Power Supply

The concept of the quiet PC began to gain real respect over 2003. Rest assured: In 2004, bleeding-edge PC builders will be gunning for the *silent* PC. We certainly are. The Phantom power supply from Antec represents a gigantic leap toward powerful PCs that don't sound like garbage disposals.

The Phantom sports a completely fanless design. In fact, the entire casing is a heatsink of sorts that attaches directly to the power supply's internal heatsink in order to channel thermal energy out and away from the guts. The moody-looking 350W PS also includes over-temperature and under-voltage protection, which is typically found only in server power supplies. The unit will be available soon for $170.

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Head2Head

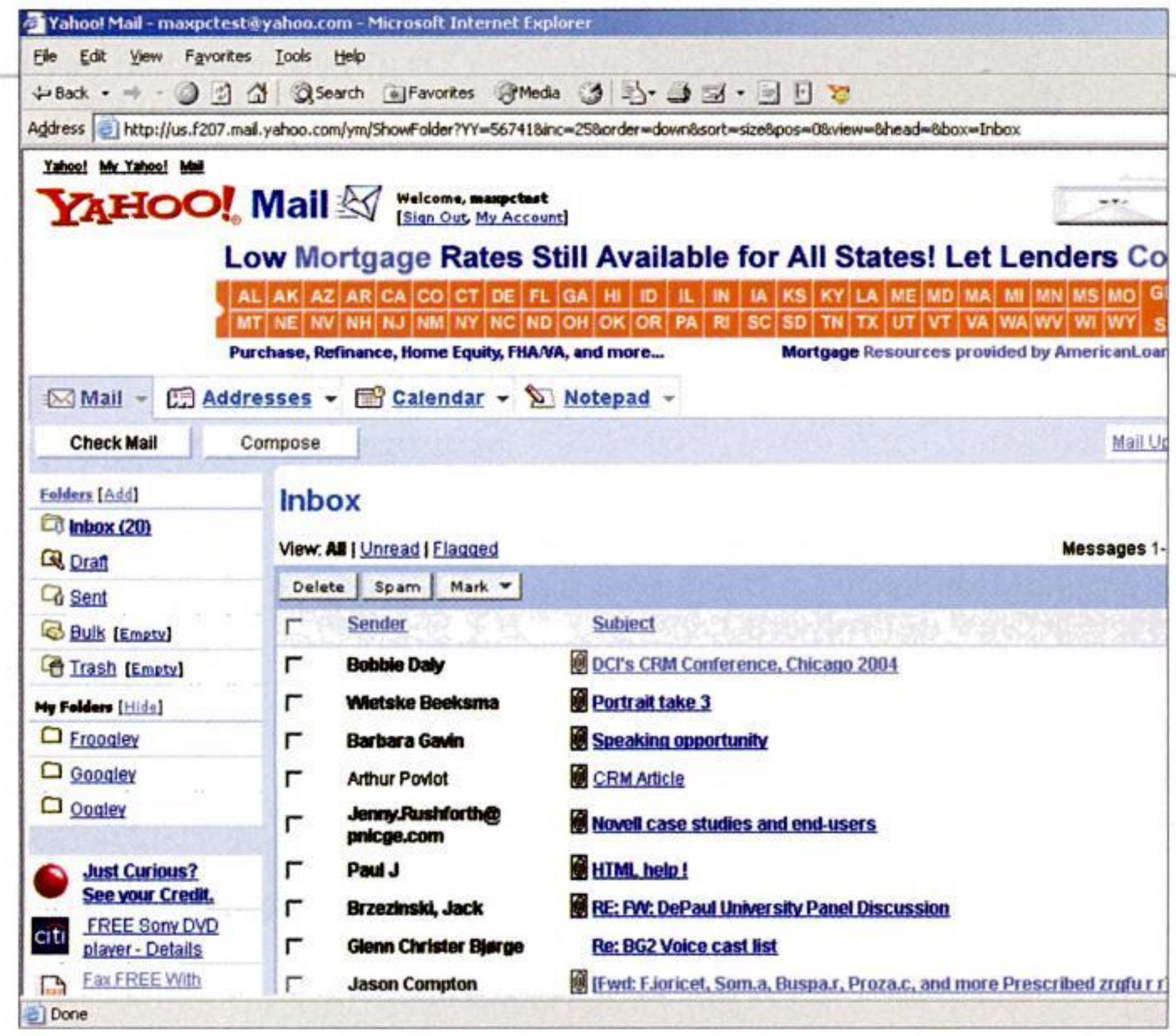
A showdown among natural PC competitors

THIS MONTH: Yahoo vs. Hotmail!

Every once in a while some smug dork announces that the age of "free stuff on the Internet" is over, but we know better. Sure, the ads are a little bigger these days, but web e-mail is still one of the best deals around. We've seen hundreds of offers for free e-mail come and go, but Yahoo and Microsoft's Hotmail service are still the biggest names with the most staying power, which is what you should look for unless you're willing to change your e-mail address at a moment's notice. Who gets your mail in on time, and who leaves you wishing you weren't so cheap? Follow along.

—JASON COMPTON

YAHOO! E-MAIL



Speed: Page loads were sometimes creaky, and Yahoo loves to ask and re-ask for your username and password by default (you can adjust this security setting in the preferences window), but the mail steadily and readily makes it through. Yahoo's prone to sluggishness around quittin' time, though, when everybody gives their e-mail one last glance before heading home from work.
Winner: Yahoo

Capacity: No contest here. Yahoo offers 4MB for new accounts, allows e-mails up to 3MB in size to go out, and even gave us a full megabyte of overage before starting to reject messages. Bonus tip: Yahoo used to give accounts a generous capacity of 6MB, and those accounts are grandfathered in. So if you know someone who isn't using his or her old Yahoo account and you like the e-mail address, ask for it very nicely. Bribes may help.
Winner: Yahoo

Spam filtering: The good news is that Yahoo offers automatic spam protection, a self-cleaning junk folder, 100 address blocks, and 15 user-definable filters. The bad news is that when we bounced 14 genuine spams to our test account (many of which were caught with other free spam filters), Yahoo let all of them through as normal mail. Oops.
Winner: Hotmail

Interface/organization: Both services have a single, large ad on the right of the screen, but Yahoo clutters the screen with more small ads. Folders and functions are easy to navigate, but the layout is a bit clunky and garish, which contributes to the longer load times.
Winner: Hotmail

Pay services: Yahoo has quite a few pay services—arguably too many, so don't make an impulse buy before reading carefully. The $30/year package that boosts capacity to 25MB and vastly improves your anti-spam options is probably the best deal, although for $10 less you can have just the storage. A gimmicky phone-access service is available for $5 a month. **Winner: Yahoo**

Search: Yahoo includes your basic case-sensitive full-text search, but almost shyly offers an advanced search mode to scan individual headers using multiple criteria, searching by date, and selecting some but not all folders. Clearly the choice for finding that elusive Evite.
Winner: Yahoo

Features: The stock stationery is cute, the visual HTML editor works about as well as it should, and there's a built-in spellchecker. All attachments are virus-scanned, and more importantly, several document types can be viewed on the page without being downloaded, meaning you can scan a *Word* document on a café computer that might not have *Word* installed. Plus, attachments can be saved directly to Yahoo Briefcase, a 25MB storage bin that comes free with your e-mail account. **Winner: Yahoo**

MAXIMUM PC VERDICT 8

YEEHAH!
Copious space and serious features.

YAWHOOPS!
Disappointing spam filter.

http://mail.yahoo.com

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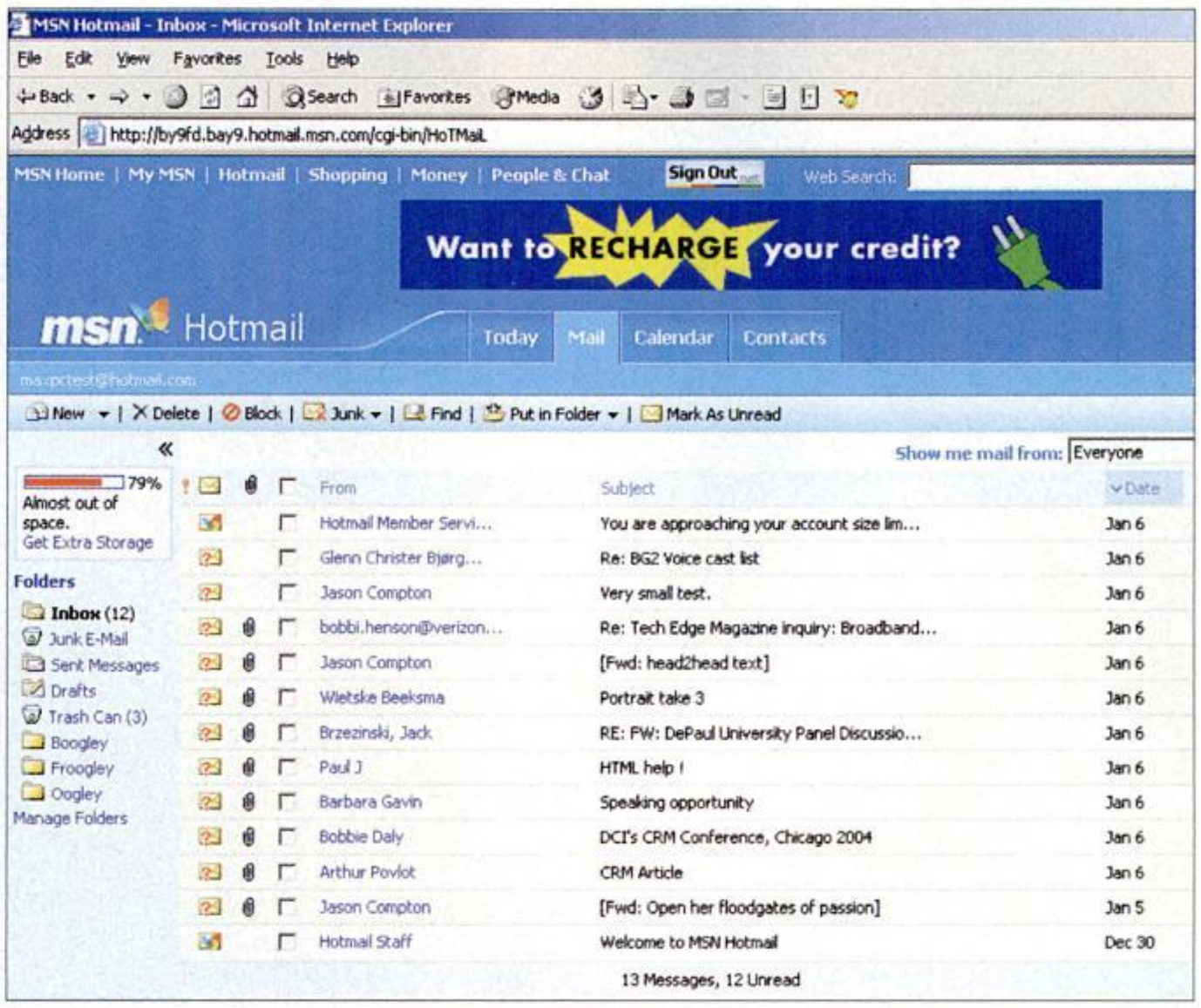
MSN HOTMAIL

Speed: When Hotmail delivered mail, it was extremely fast, and page reloads on the whole felt faster than Yahoo. But some e-mails went undelivered for a long while, and worrying over e-mail isn't a convenience feature. **Winner: Yahoo**

Capacity: Apparently Microsoft believes its core business is software, not hard drives. Hotmail offers a stingy 2MB inbox and virtually no grace overage before messages get Returned To Sender. Limits on incoming and outgoing e-mail are a similarly frugal 1MB. **Winner: Yahoo**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Hotmail Staff Welcome to MSN Hotmail Dec 30
13 Messages, 12 Unread

Spam filtering: Hotmail offers two levels of spam filtering as well as a whitelist mode which lets only approved senders get through. Addresses may be blocked and up to 10 user-definable filters created. The filters worked well in normal mode, but we had some problems with Hotmail's "Enhanced" junk filter. Unlike Yahoo, which allowed our 14 test spams through, Hotmail filtered eight as spam—and simply didn't deliver the other six at all, which is not supposed to happen. Hotmail's spam blocker is stronger, but in Enhanced mode, it's a little too strong. **Winner: Hotmail**

Pay services: There's really only one premium Hotmail service. $20/year gets you 10MB of storage, the freedom to send or receive 3MB at a time, more custom spam filters, and a 30MB attachment storage bin. Plus, your account won't be cruelly deleted if you neglect it for a month, as it would with the free service. This means Hotmail's pay service expects you to fork up for basically the same flexibility you get with Yahoo's free account. Not impressive. Unlike Yahoo, there's no option—free or not—for POP access of your Hotmail account, although there are free tools to strip both Yahoo and Hotmail inboxes anyway. **Winner: Yahoo**

Searching: Hotmail dishes up a perfunctory interface: search for a word or phrase, search an individual folder or all folders, search headers or all text. Powerful enough to answer most "where did that joke go?" questions, but doesn't go that extra mile. **Winner: Yahoo**

Interface/organization: Because it's MSN-branded, Hotmail is a little too eager to push other MSN junk at you on the screen, but once you know where to look, it's easy to get to what you really want—your damn messages—and get out. Layout is tight and the interface feels more like a real Windows app rather than a clunky web form—it's slick. A little fiddly at times with small text and smaller drop-down boxes, but still slick. **Winner: Hotmail**

Features: Hotmail distinguishes itself with one-click access to a dictionary and thesaurus if you're at a loss for words. Attachments are scanned for infection and given a very formal-looking seal of approval, but that doesn't make up for overall weaker attachment handling (strange that Microsoft's Hotmail won't preview *Word* docs) than the competition. **Winner: Yahoo**

MAXIMUM PC VERDICT 7

+ HOTMAIL

Sanity-protecting spam filter is a bit cranky, but stops the bloat.

− COLDMAIL

Relatively mediocre search, stingy inbox capacity, and occasionally slow delivery rates.

www.hotmail.com

THE UPSHOT

You get what you pay for, and neither Hotmail nor Yahoo owe you an explanation for any glitches, gimmicks, or glaring box ads that get in the way of your e-mail. Both tag the bottom of your outgoing messages with plugs, so everyone knows you're a cheapskate. But let's not mince words: **Yahoo's the winner.** It's got features and space to spare, while Hotmail's a touch more refined, if wimpy. Now, go on, and sign up for that *Thundercats* fan-fiction mailing list that you wouldn't want to be caught contributing to under your real name. ■

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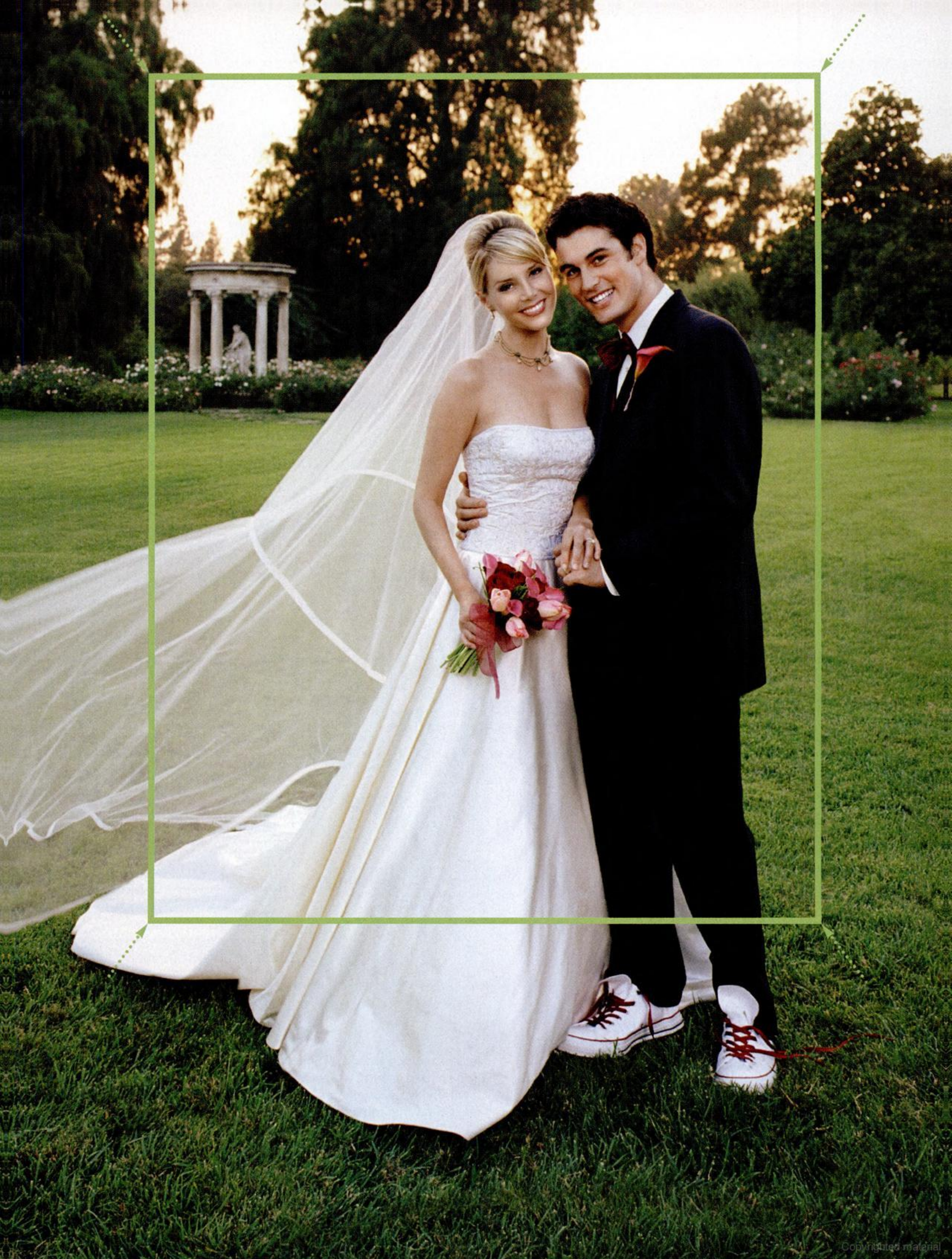

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WatchDog

Say hello to Arnold, WatchDog of the Month.

Maximum PC takes a bite out of bad gear

THIS MONTH: The WatchDog goes after...

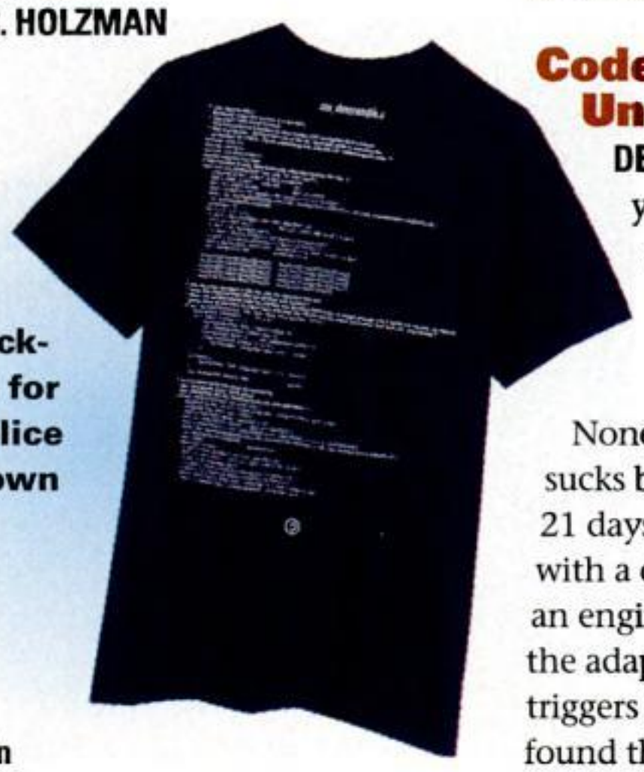
>Copyleft.net **>CodeUnderground** **>Scummy Scammers**

Copyleft.net Exits Stage Left?

DEAR DOG: I ordered a great shirt from the web site **www.copyleft.net** in early December. My debit card was charged, the money removed from my checking account, and a confirmation e-mail was sent. No shirt ever arrived. Follow-up e-mails go ignored, and the one other e-mail address the site offers is invalid.

Is the site defunct? What's going on? The DeCSS shirts were very cool and I know of several people who purchased them months ago with no problems.

—C. HOLZMAN



If you could actually read the code printed on this T-shirt, jack-booted thugs for the DMCA police might kick down your door.

THE DOG RESPONDS:

There's bad news in geekville. Copyleft.net, which sold T-shirts and merchandise promoting all things geeky, may be a goner. Among the goods Copyleft sold were shirts bearing the source code to DeCSS, which can be used to remove encryption from DVD movies. (The shirts were seen as a way to protest a perceived violation of First Amendment rights.) Under the draconian DMCA law, reproduction of the code or linkage to a web site publicizing it was ruled illegal by the courts.

Holzman isn't the only person to complain about Copyleft.net. A perusal of the site's forums shows that other consumers have had similar problems. "I ordered one of these shirts in July and have received nothing. Not only that, but this jerk still has my credit card number and all my personal information," one alleged customer wrote. Another wrote, "Has anyone actually received one of these shirts yet?! I'm so horribly angry right now that I'm ready to go to the Better Business Bureau for some serious ass-whippage."

Others on the web site report that they did receive the shirts, albeit well before the holiday season, which is when the web site stopped responding to customers. E-mail and phone calls from the Dog to Copyleft.net went unanswered.

What happened to Copyleft? Perhaps jack-booted agents of the DMCA finally caught up with the site's owner. Regardless, given Copyleft.net's poor response to its customers, the Dog recommends that readers avoid the site like a mad cow. Woof.

Codeunderground Goes Underground

DEAR DOG: In your December Gift Guide, you recommended an Xbox-to-PC adapter, which I thought was a great idea. But I have to wonder if you guys even tested it. Why? There is no web site named **Codeunderground.com**. None. zero. Second, the controller adapter sucks big time. It doesn't work at all. It took 21 days to be delivered, and it didn't come with a driver. It's like buying a car without an engine. When I did find the driver for the adapter, WinXP detected it fine but the triggers didn't work. I did some research and found that I'm not the only one who has this problem. I just wish I did the research before I bought it. The only reason I didn't was because you guys recommended it in your mag. Right now, I'm trying to get my money back. I just want you to let others know not to buy this adapter. It's junk.

—JIM

THE DOG RESPONDS: At the time of our gift guide, CodeUnderground.com did exist, but it appears that since we published our story in December, the site has gone away for good.

In March 2003, CodeUnderground admitted it had been undergoing difficulties on its web site: "Since March 7, we have had about 10 support requests to every one cable order. Some of these requests have been from users claiming to have bought a cable—but they did not buy one from us."

CodeUnderground went on to say that the extra support costs seemed to be from another company that was selling a knock-off cable without the driver. According to the CodeUnderground site, that company simply linked to CodeUnderground.com and shunted all its support there.

"We are currently in the process of deciding how best to continue, but for now, the driver and user support will remain free. We will also continue to sell cable adapters. Please be considerate when requesting support. Rude, demanding, or insulting requests will not receive a response.

Those of you who have purchased cables will continue to be supported regardless of what we decide. You can also expect to receive discounts on future products or services. We thank you for your support."

Apparently the cost of trying to support its own customers and those of the other company finally took CodeUnderground offline. The Dog was unable to reach any of CodeUnderground's principals as of press time. It goes without saying, the Dog recommends that consumers avoid the company's products.

The Xbox controller-to-PC adapter from CodeUnderground.com is no more.

> *"I'M SO HORRIBLY ANGRY RIGHT NOW THAT I'M READY TO GO TO THE BETTER BUSINESS BUREAU FOR SOME SERIOUS ASS-WHIPPAGE."*

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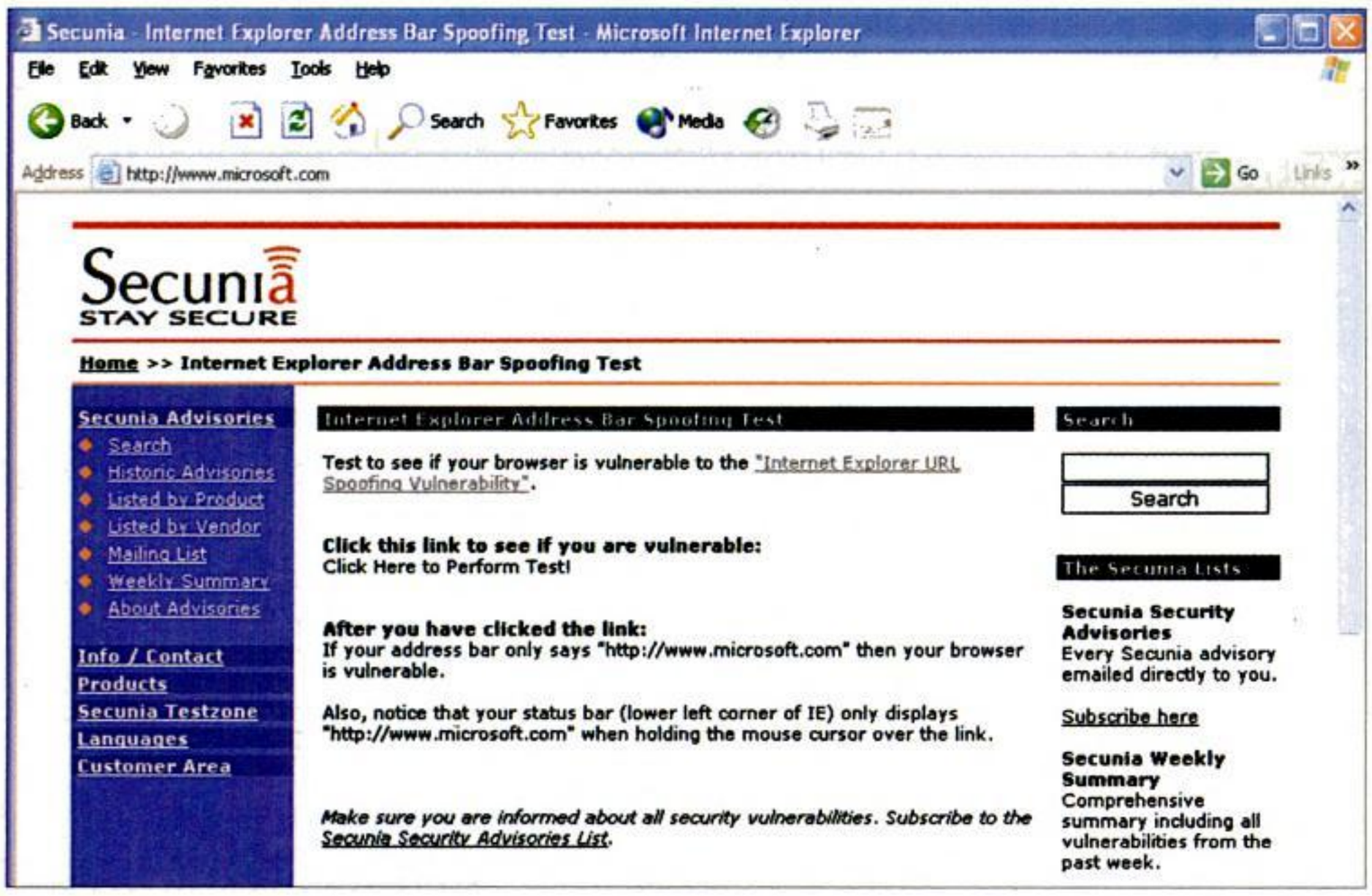
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Also, notice that your status bar (lower left corner of IE) only displays "http://www.microsoft.com" when holding the mouse cursor over the link.
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Comprehensive summary including all vulnerabilities from the past week.

At first glance, you might think you're at Microsoft.com, but you're really not, thanks to a new spoof that's already being used to trick consumers into giving up PayPal and eBay account information.

Incidentally, the Dog wonders how Jim was even able to purchase his adapter. If, as he says, the site never existed, he couldn't have procured the adapter or downloaded the software from CodeUnderground. Is it possible he received one of the adapters from the competing company? That might explain why his experience with the device was so different from our own. Arf.

Scummy Scammers Part Deux

DEAR DOG: In January's Watchdog reply to "Scummy Scammers," users are advised to "make sure they are indeed at the web page they think they're at by enabling the Status Bar on *Internet Explorer.*"

That used to be excellent advice, until now. Due to the latest Microsoft *Internet Explorer* exploit called "URL-spoofing," would-be thieves can make any URL appear in IE's title bar, status bar, and address bar. For example, it may appear that you're at **www.paypal.com,** when in fact you're on a scammer's server. To view this flaw in MS *Internet Explorer* first hand, visit **www.secunia.com/internet_explorer_address_bar_spoofing_test/** click Perform Test, then observe the spoofed URL in the address bar and status bar.

Another site claims Microsoft is fully aware of the flaw in its software, but has yet to offer a solution. Mozilla's *Firebird* browser is also susceptible via the status bar, but interestingly, the address bar does hint at the real address, at least enough to alert you that something's fishy.

At this time, the best advice may be to manually type the URL you desire to visit, such as **www.paypal.com,** instead of trusting a link, and get Mozilla *Firebird* while you're at it.

—MARK SIMMONS

THE DOG RESPONDS: Excellent advice, Mark. Obviously, everybody should exercise extreme caution when accessing any sensitive web site, such as eBay, PayPal, or financial sites, which are prime targets of scammers. And until this spoof is corrected by Microsoft, it would be better to open a new browser window and type in the URL when you want to visit a web site.

Mark also provided this list of sites, which further explain the problem:

- **www.dfwfrag.com/modules.php?op=modload&name=News&file=article&sid=90**
- **www.terrorist.net/webdocs/urlspoofing.html**
- **www.niagaracu.com/spf.htm**
- **www.frame4.com/php/modules.php?name=News&file=printpdf&sid=1450**

"AT THIS TIME, THE BEST ADVICE MAY BE TO MANUALLY TYPE THE URL YOU DESIRE TO VISIT INSTEAD OF TRUSTING A LINK, AND GET MOZILLA FIREBIRD WHILE YOU'RE AT IT."

Hard Drives Not So Silly After All

DEAR DOG: In your December 2003 column, you commented that the lawsuit about hard drive sizes is "pretty silly." While I'll acknowledge that there *may* be better uses of time, as hard drive sizes get larger, it would be nice if hard drives were labeled in a clear, unambiguous way that does not force the consumer to calculate the true size of the hard drive.

Also, I recall that it was a lawsuit by the Merced County District Attorney in California that finally forced monitor manufacturers and sellers to label all advertisements and literature with a monitor's true viewable size.

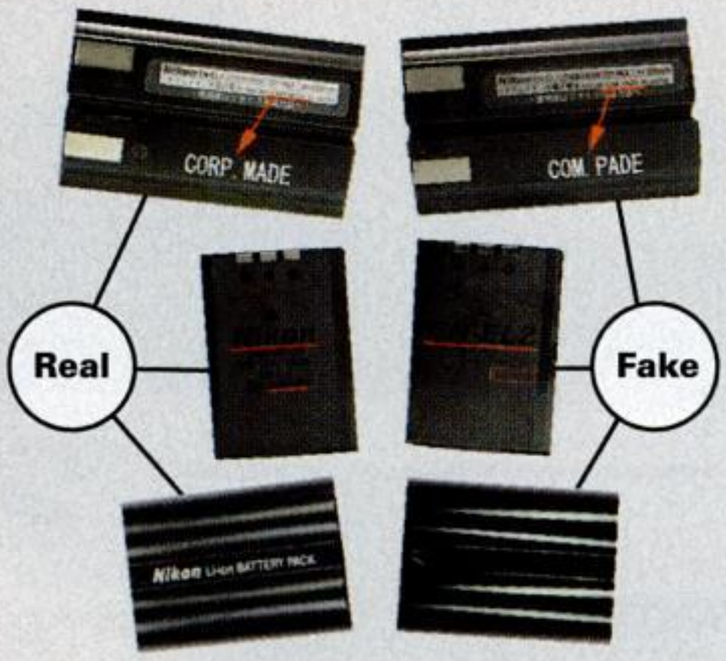
If the group from Los Angeles wins, I'm certainly not going to complain. More power to them!

— JOSHUA KUGLER

COUNTERFEIT ALERT

Counterfeit Alert

Nikon has issued a warning to consumers to be on guard against Nikon-branded counterfeit batteries that could overheat and burst. Nikon said the counterfeit batteries don't seem to feature a thermal safety that's built into Nikon digicam batteries as well as those from other major battery distributors. Nikon doesn't say whether the counterfeiting is limited to specific battery lineups, but the only way to be sure is to purchase batteries from reputable dealers and exercise common sense: If the battery seems too cheap to be true, then it probably is.



Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing **watchdog@maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

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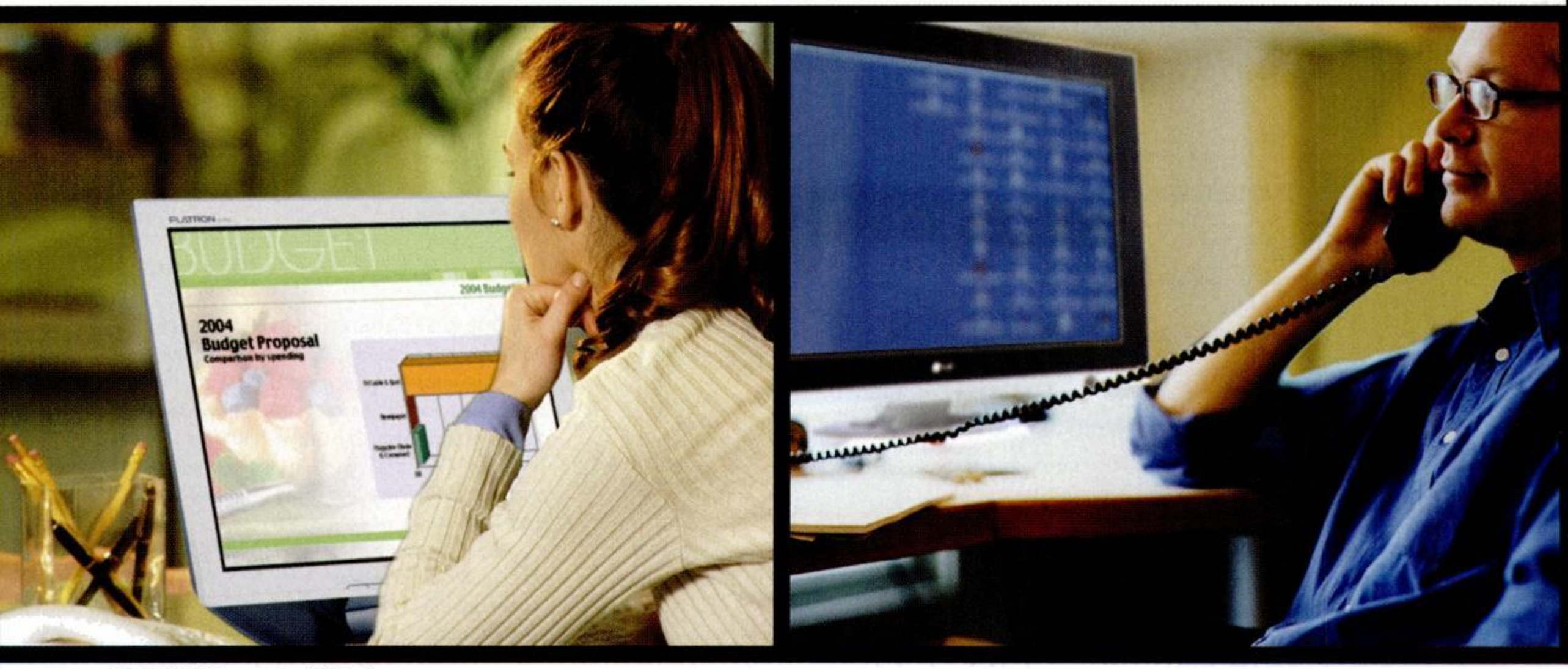

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Why Isn't Prescott Pentium 5?

How does Intel's new Prescott CPU stack up? Is it worthy of residence in your existing motherboard? *Maximum PC* Senior Editor Gordon Mah Ung investigates the low-key release of a redesigned, feature-laden chip that deserves to be called Pentium 5, yet surprisingly isn't

Sometimes more gets said when nothing changes than when big changes occur. Take for example, Intel's shiny new CPU, code-named Prescott. Despite several marked changes, Intel is downplaying the much anticipated release of a CPU that could have easily warranted a Pentium 5 label.

New SSE instructions almost single-handedly compelled Intel to drop the Pentium II name for Pentium III. Similarly, when Intel instituted SSE2 instructions and a completely redesigned core, it couldn't help but adopt the Pentium 4 moniker. Prescott features a new instruction set called SSE3, a redesigned pipeline that will take the chip up to 5GHz, double the cache, and a major die shrink. Thus the question: *Why isn't Intel calling this new chip Pentium 5?* And why the muted fanfare surrounding Prescott? And does it contain dormant 64-bit extensions?

We've got answers. →

BY GORDON MAH UNG

Prescott at a glance

NAME	Pentium 4
CODE-NAME	Prescott
CLOCK SPEED	3.4GHz "E"
DIE SIZE	112mm²
TRANSISTORS	125 million
L1 CACHE	16KB
L2 CACHE	1MB
SPECIAL INSTRUCTIONS	MMX, SSE, SSE2, SSE3
PROCESS	90 nanometer using strained silicon

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Q: What's so great about Prescott?
Prescott's architectural advances represent a significant, forward-thinking leap for processing technology. However, in terms of performance, you likely won't see any substantial performance benefits anytime soon. It will take between six and 18 months for applications to take advantage of the CPU's much longer pipeline and new instructions. But with that said, because of its price and scalability, this will likely be the CPU we're using by next year.

Q: Why isn't this Pentium 5? Is Intel afraid of the P5 designator?
If you subscribe to the speculations of forum conspiracy theorists, then, yes, Intel may have indeed been afraid to call Prescott Pentium 5. But the reasons may not be what you expect.

The "performance dread" conspiracy theory goes like this: Because any CPU successor should be faster than the chip it's replacing, and because the Prescott is slower than the Pentium 4 Extreme Edition (read on for details), Intel decided that it would have a hard time selling a Pentium 5 that ran slower than a Pentium 4.

The "common business sense" conspiracy theory is more reasonable. It goes like this: Not wanting to hurt holiday sales of the Pentium 4 by tantalizing consumers with a brand-new CPU, Intel chose to keep the P4 nomenclature. "I've been calling it Pentium 5 since last year," says analyst Rob Enderle of the Enderle Group, who forwards the theory that business sense and not performance anxiety is behind the P5-minus-1 name. "When they didn't call it [P5], it surprised the hell out of me." Intel's strategy seems to have worked because sales were good this holiday, Enderle explains. He opines that had Intel released the Prescott on time last year, it likely would have been called Pentium 5 to much fanfare.

So what's the real reason? Intel says only that there is no exact science for its CPU names. And even though the performance theory is juicier, we think Enderle's may hold more water. After all, Intel has introduced a slower processor before without blinking. In fact, upon its release, the first Pentium 4 was soundly trashed in many older applications by the Pentium III.

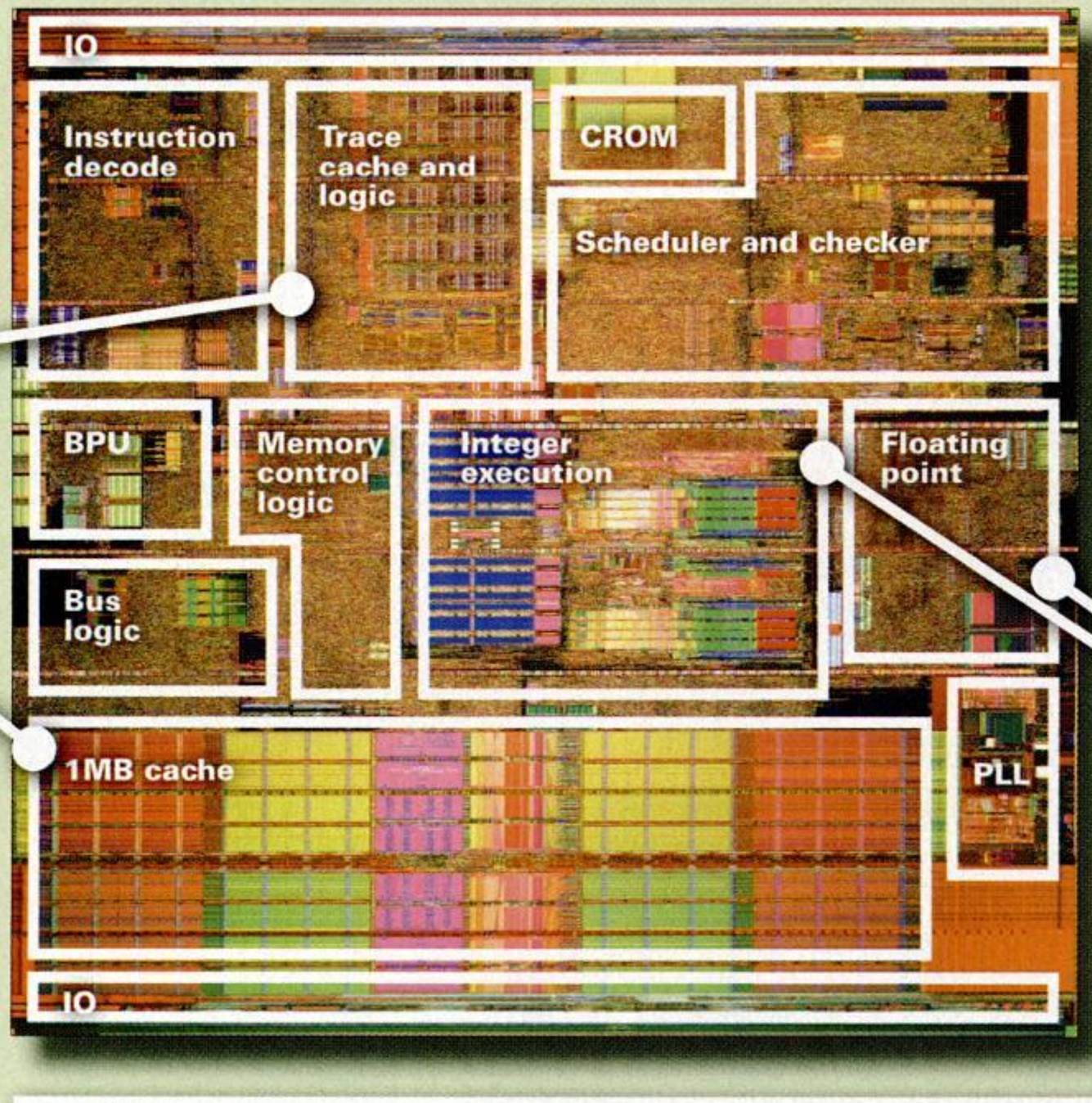
Behold Prescott!

Intel makes tiny steps forward. We've got the map!

To get a sense of how tiny the 90nm process is compared with the current 130nm process, note that Prescott has more than twice the number of transistors than the current Northwood Pentium 4, yet is 33mm² smaller. To imagine the size we're talking about, consider this: A nanometer is only 3 to 5 atoms wide, and the period at the end of this sentence is 250,000 nanometers across.

Prescott still retains the 12KB trace cache of the original Pentium 4 but increases the L1 data cache to 16KB from 8KB. Unlike older CPU designs, like the Pentium III, the P4 series can store up to 12KB of simple instructions that have been decoded from x86 instructions into what Intel calls micro-ops. Since the instructions are stored in a decoded state and ready to be executed, the CPU experiences an increase in performance.

If you read Tom Halfhill's column last month (February, "Dreaming of a Cacheless Society"), you know that caches are a necessary evil of today's computers. The world would be a better place if CPUs didn't have to use big fat caches to make up for slow-ass system RAM. Prescott's cache is double that of the Northwood 1MB. Like all CPUs, cache memory is made from expensive SRAM. In the Prescott core, the 1MB of L2 accounts for roughly 48 million of the 125 million transistors.



Other enhancements in Prescott:
- An improved branch predictor speeds up productivity applications.
- Twelve additional store buffers over the Northwood's 24 help keep data moving through the ultra-long pipeline.
- Two more write combining buffers (for a total of eight) help reduce bus traffic.

There are no additional floating-point units in the heart of the Prescott, but Intel has added an additional integer multiplication unit that no longer shares resources with the floating point multiplication unit, which will result in reduced processing latency.

Prescott's improved process
- Prescott features a seven-layer vertical process vs. Northwood's six layers, which helps reduce the transistor density on the core and reduce the wire delay, or latency of signals moving through the core. Think of a layer as a floor in a building; more vertical layers saves horizontal space.
- Prescott CPUs will also use carbon doped oxide to increase the wire transfers in the transistors as well as nickel silicide to improve speed through lower resistance.
- Intel will use strained silicon in the Prescott core so electrons can flow faster.

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Q: What's new and different in Intel's new CPU?

The really big news with Prescott is the shift from the current 0.13-micron or 130-nanometer process Intel has been using for the Pentium 4 since the second-generation Northwood version was released in 2001 to a new 90-nanometer process. This new process gives Intel a few advantages besides the ability to cram more transistors into a smaller space.

Anytime you shrink the size of the circuits in a CPU, you also shrink the distance electrons must travel to get from point A to point B. Consequently, less voltage is used, which creates less heat. This means the CPU can run at higher clock frequencies.

Intel's original 1.5GHz Pentium 4, code-named Willamette, ran hot because it used a 180-nanometer process. As a result, the CPU didn't overclock very well and ran out of gas at 2GHz. Shrinking the die to 130 nanometers allowed Intel to run the Northwood all the way from 2GHz to 3.4GHz with no end in sight. Shrinking the die to 90nm will greatly benefit Intel's—and perhaps consumers'—bottom lines as it will substantially reduce production costs.

But beyond the die shrinkage, Intel has tinkered quite a bit with Prescott's actual core. The biggest enhancements include: 13 new instructions called SSE3, double the amount of both L1 and L2 cache (16KB and 1MB, respectively), and a new pipeline with a whopping 31 stages. Better thermal protection and enhanced Hyper-Threading are also included.

As a CPU core, Prescott has changed significantly from the Northwood, much more so than the jump from the original Willamette P4 to Northwood. All told, the Prescott is quite a different beast indeed. The result will be hockey-stick style performance increases as the CPU's clock speed is boosted and applications become more capable of using the new instructions and extended pipeline.

Q: Are the rumors true that dormant 64-bit support extensions have been tucked into Prescott?

Despite many rumors circulating on the Internet, Intel has continued to publicly deny that 64-bit extensions are hidden in the Prescott, and insists that its server-based Itanium CPU is the company's only 64-bit processor. So we asked the company point-blank: Does Prescott contain 64-bit extensions? Intel refused to comment, but the company did take the opportunity to diss AMD: "For us to enable such a thing in an Intel volume mainstream processor, we would need to validate the design with a production mainstream operating system with a wide variety of device drivers in the client space. That isn't here today."

Herein lies AMD's 64-bit conundrum. Microsoft still hasn't released its 64-bit version of Windows, and—at least according to reports we've heard—porting Win XP drivers to the beta 64-bit is turning out to be far more challenging than AMD originally indicated. (For more on AMD's strategy, turn to page 35).

Q: What instructions are in the new SSE3 set and how can I take advantage of them?

SSE gave us 72 instructions that programmers could use to enable applications—particularly games and multimedia—to run faster. SSE2 gave us 144 instructions for handling multimedia, gaming, and floating-point and integer conversions. In contrast, SSE3 gives us just 13 new instructions. Despite its fewer instructions, the goals mostly remain the same as before: better floating-point and integer conversions, and faster video encoding. There are also new instructions for better synchronization of application threads.

As always, you won't experience any immediate benefits from the new instructions. Existing applications will have to be either patched or recompiled to take advantage of SSE3. Intel couldn't provide any applications that supported SSE3 at press time, so we found it difficult to measure their effectiveness. In the past, however, special instructions have made quite a difference. For example, if you were to compare a 450MHz Pentium II to a 450MHz Pentium III with SSE, you'd find that the P-II lays bricks compared with the P-III in MP3 encoding. So, to some extent, you do get more performance by buying instructions that you won't be able to use for 12 to 24 months. On the other hand, why pay a premium for new instructions that you won't be able to use for 12 to 24 months?

Q: What are the benefits of the 31-stage pipeline and what are the penalties?

When the P4 first came out with its (then) phenomenally long 20-stage pipeline, we wrote: "Long pipelines are inherently friendlier to high clock speeds."

An analogy will help explain this statement: A CPU's pipeline is much like a car factory's assembly line. Over at the Athlon XP factory, which has 10 stages (that is, 10 assembly line stations), each worker at each station is assigned a relatively large amount of work. For example, a single worker might put on a hub cap, screw in a dashboard, and install windshield wipers—and all this work must be completed before the unfinished car can proceed down the line. Because only one worker can attend to the car at any given time, the assembly line moves only as fast as the ➔

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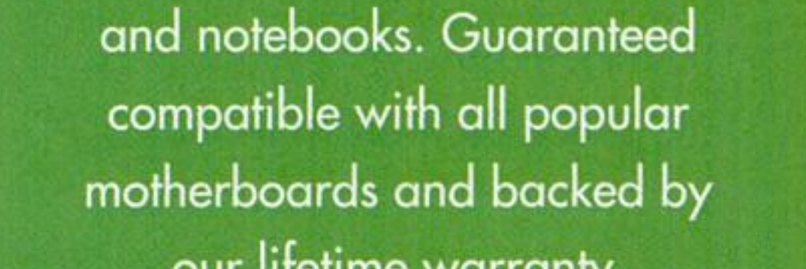

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slowest worker on the line. The same goes for CPU pipelines.

Over at the Pentium 4 factory, there are 20 stages, or 20 workers, attending to number-crunching the instructions at hand. And because there are more workers on the line, each P4 worker has relatively fewer tasks to perform at his particular station. Thus the P4 assembly line can move along much, much faster than the Athlon XP assembly line with its modest staff of just 10 workers.

To continue our analogy, for its Prescott architecture, Intel has hired 31 hard hats to build the car. So instead of each worker having to perform two tasks (say putting on windshield wipers and installing an airbag), each worker simply screws on a single lug nut before sending the car along. The entire assembly process is completed more quickly because the production line is moving at a breakneck pace.

At 3.4GHz, Prescott is simply idling; at this speed it's not really using the extended pipeline. Hence the lackluster performance we're currently seeing. As higher clock speeds begin to take advantage of the 31-stage pipeline, we'll see massive speed boosts.

Q: So why don't they build 50-stage pipeline CPUs all the time?

Easy, turbo. You're getting a little ahead of the curve. A long pipeline is only beneficial if you can run it at high speeds. If you can't increase the speed of the assembly line, a long pipeline can actually hurt performance. That's because a long pipeline is designed to rapidly move data without any hitches. A hitch would be a branch misprediction. Here's how that works—or doesn't work, as the case may be:

A branch is like a fork in the road—a point at which a question must be considered, and then executed upon: Will the sales office sell more red sports cars with turbo engines or more cars with naturally aspirated engines? By asking this question before a decision has to be made, and by (hopefully) answering the question correctly, valuable time and resources can be saved. In terms of CPU operation, at each branch, a CPU can forecast a likely operation that will have to be executed in the future, and then prepare for that operation beforehand. It simply requires highly sophisticated branch prediction algorithms.

But problems arise when the CPU makes an incorrect prediction, and in turn performs an unnecessary operation. In terms of our assembly line analogy, if the factory discovers that it should have been building more turbo cars all along, all the cars with regular engines currently in the assembly line need to be flushed from the system and sent back for turbo installation. In our short pipeline with only 10 stages, it's fairly easy to clear the old engines out and commence building cars with turbos.

On the flipside, in the Pentium 4 Prescott factory, you have to clear far more parts and spend more time refilling the pipeline before work can begin again. At low clock speeds, this process moves so slowly, the CPU foreman might as well blow a whistle and cry "yabba-dabba-do" before sliding off his dinosaur for a lunch break. At higher speeds, the impact of branch mispredictions is minimized because the entire line is moving so much faster. Branch mispredictions can also be minimized by the branch predictors' level of sophistication.

In addition to smarter branch prediction logic, Intel has doubled the L1 and L2 caches, as well as increased internal buffers to protect against branch mispredictions.

Q: Is there an optimal speed at which the Prescott should be running? How far will it scale?

The CPU nerds we talked to were surprised to hear that a 31-stage CPU would be introduced at just 3.4GHz instead of a fantastical-sounding 5GHz. It's hard to say at exactly what speed the Prescott will really begin to offer the kind of dramatic performance we've been drooling over. To give you an idea, the 20-stage Pentium 4 Northwood didn't really exhibit substantial performance increases over the Athlon until it was well into the 2.5GHz range. Our guess is that the Prescott won't realize its full performance potential until it reaches clock speeds of 4GHz. Like the Pentium 4, Intel designed the Prescott core to scale up to 5GHz; other iterations of its architecture (in subsequent CPU releases) will likely be capable of reaching 10GHz.

In addition to the 31-stage pipeline, the Prescott features greatly improved clock distribution in its core. If you think of the CPU die as a small silicon city where data must flow through grid-locked streets, Prescott's general plan for roads is designed for electrons to travel more efficiently. This translates into even greater clock speeds.

Prescott is also Intel's first attempt to use strained silicon on a mass CPU. Strained silicon is a method of stretching silicon so that its atoms are aligned to allow electrons to move through the chip faster.

With more internal buffers (32 versus 24 in Northwood), Prescott has more write-combining mechanisms that help

Pipeline Architecture

Prescott's longer pipeline = higher clock speed

A CPU's pipeline generally determines the clock speed its micro-architecture can hit, process technologies notwithstanding. The more stages in a pipeline, the less each stage has to do, and the faster you can push data through. Intel's new Prescott core features a shockingly long 31-stage pipeline. That's 11 more stages than the original P4, and eight more than Apple's G5! To illustrate the pipeline/clock speed relationship, we compared the Pentium III, P4 Northwood core, and the P4 Prescott core.

10 STAGES
ARCHITECTURE: P6
CPUS: Pentium Pro, Pentium II, Pentium III, and Pentium III for Servers
CLOCK SPEED AND RELEASE DATE: 200MHz Pentium Pro on August 18, 1997
HIGHEST CLOCK AND RELEASE DATE: 1.4GHz Pentium III-S on January 8, 2002

20 STAGES
ARCHITECTURE: NetBurst
CPUS: Pentium 4
CLOCK SPEED AND RELEASE DATE: 1.5GHz Pentium 4 Willamette on November 20, 2000
HIGHEST CLOCK AND RELEASE DATE: 3.4GHz Pentium 4 Northwood on February 2, 2004

31 STAGES
ARCHITECTURE: NetBurst
CPUS: Pentium 4 Prescott core
CLOCK SPEED AND RELEASE DATE: 3.4GHz Pentium 4E on February 2, 2004
HIGHEST CLOCK AND RELEASE DATE: Projected to reach 10GHz

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lower bus and port traffic to the cache. Also new is an integer multiplication unit that will no longer tie up the floating-point unit's time. This will benefit FPU-intensive applications like encryption and other math-intensive applications.

Q: Is Prescott the only new CPU from Intel this time?

No, and the clutter that Intel's launch strategy has created is somewhat confusing. Intel actually released three new chips this winter, each at 3.4GHz, or 200MHz faster than the previous P4s. The first is a familiar Northwood Pentium 4 in "C" trim on an 800MHz bus. It still retains 512KB of L2 cache and uses the older 130-nanometer process. The second CPU is the Pentium 4 Extreme Edition, which adds a whopping 2MB of L3 cache to the chip. Aimed at power users and gamers, the Extreme Edition is extremely hard to find and commands a premium price. These factors have people derisively calling the P4 EE the "emergency edition" or "expensive edition."

The third 3.4GHz Pentium 4 CPU is the Prescott. All three will run on the 800MHz bus and fit into Socket 478 motherboards.

Q: If Intel is introducing three 3.4GHz Pentium 4 chips, how will I be able to tell the difference? And what speeds are coming out?

Intel's nomenclature, as always, seems pretty whacked. But the problem isn't the triplet of new 3.4GHz speeds, it's trying to determine which chips are Prescott CPUs at the lower speeds. The 3.4GHz P4 Extreme Edition will be easy to differentiate because it will be the only one to carry the "Extreme" moniker. The 3.4GHz Northwood will be simply "3.40 Pentium 4" and the Prescott will carry an "E" designator. Thus the fastest Prescott will be a 3.40E Pentium 4. Simple, right?

Unfortunately, it gets dizzying when you consider that Prescott will be introduced at 3.4GHz, 3.2GHz, 3GHz, and two different 2.8GHz versions. All of the 800MHz bus Prescott chips will carry the "E" designator; the 2.8GHz Prescott running on the 533MHz bus will carry the designation of "A"—2.80A Pentium 4. But wait—it gets even more confusing when you remember that there is a 2.80C Pentium 4 Northwood on the 800MHz bus, but no "B" version (which is commonly used to denote the 533MHz bus processors). Intel oddly omitted the B from the 2.80 Pentium 4 Northwood on the 533MHz bus. Even more bizarre, Intel has decided to not offer Hyper-Threading on the 2.80A Pentium 4 Prescott, making it the gimpiest of all Prescotts. Did Intel's marketing department get this "who's on first" routine straight from Abbott and Costello?

Q: Will Prescott work with my existing motherboard?

Although Prescott still fits into Socket 478 boards, it's really up to your motherboard as to whether or not it will work. That's because, despite the smaller process and more efficient core, a 3.4GHz Prescott runs hotter than a 3GHz P4 by about 20 percent.

Besides running hotter, the Prescott is also a power hog. In fact, some early 875P- and 865P-based mobos that didn't use heavy-duty voltage regulators may not have enough juice to run it. Generally, if your board is rated to run a P4 Extreme Edition, it'll probably run Prescott. To be sure, visit your motherboard maker's web site and see what it says your board is rated to run.

Interestingly, Prescott will include a new feature where the CPU tells the system how hot it can run. Before, CPUs were generically assigned thermal limits based on the entire line. With the Prescott, each chip will have individual points they can reach before telling the system to throttle down. The ramifications of this new feature aren't quite clear, but Intel said the average consumer with a properly cooled CPU will never even notice the feature. Even so, if you're upgrading to Prescott from a slower Pentium 4, you'll want to make sure the heatsink you buy is rated for Prescott's higher temperatures.

Q: Will Intel give consumers a price break because Prescott has moved to a smaller process?

It's true that the new 90nm process will allow Intel to jam more transistors into its core than before. For example, even though Prescott Pentium 4 will have 70 million more transistors than the current Northwood Pentium 4, it fits into a die that's 33mm^2 smaller than the current P4. This means that if every core on a wafer were perfect, Intel could make roughly 30 percent more CPUs per wafer. Is there any chance you'll get a price break? Only in your dreams. It's not likely that the yields will be perfect on each wafer. And Intel still has to pay for the new fabs and associated R&D. You will, however, feel some price advantages as time goes on and Intel perfects the new process.

Besides the smaller process, Intel is beginning to convert many of its fabs to use larger 300mm wafers instead of 200mm wafers. By itself, moving from a 200mm wafer to 300mm yields a 2.3x increase in cores. If Intel decides to engage AMD in a price war, the smaller, more efficient 90nm process combined with 300mm wafers will give it the upper hand—for

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now. Currently, Intel has three fabs ready to crank out Prescott CPUs.

Pricing on Prescott and the two other 3.4GHz Pentium 4s wasn't available at press time but you can expect them to take the place of the company's existing top chips. Thus the 3.4GHz P4 Prescott (as well as the Northwood version) will probably cost close to $637. The Extreme Edition will still cost close to $1,000 per chip.

Q: How far into the future will Prescott take us? Will we see an Extreme Edition version?

By design, Prescott should hit 5GHz without breaking a sweat, but later this year, Intel is expected to introduce a successor to Prescott code-named Tejas. Tejas will also be a 90nm CPU, but will run on a new 1066MHz bus and include even more improved Hyper-Threading and possibly even more instructions. More importantly, Tejas is expected to be rolled out with a new type of CPU interface that will make Socket 478 obsolete. Additionally, Tejas chipsets will also introduce PCI Express, PCI Express for graphics, DDR2, and a new 24-bit audio spec for motherboards called Azalia, or High Definition Audio.

We expect Tejas to be the CPU dubbed Pentium 5. In the meantime, Intel is still contemplating the introduction of an Extreme Edition version of the Prescott with additional L3. Exactly how much cache, and when a Prescott EE might be released aren't known. We're not holding our breath. We're betting that Intel is pinning its hopes on Tejas becoming enough of an A64 killer that the company won't even need to invest in making larger cache versions of its chips to compete.

Q: Would you buy a Prescott?

The short answer is no. We're performance freaks, and right now the Pentium 4 Extreme Edition is the CPU tickling us in all the right places. However, at higher clock speeds, it's clear that Prescott will definitely be a force to be reckoned with. At that point, we'll be all over it. But at its present speeds, it's in a firm third place.

The longer answer is that there's good and bad news for Intel. The good news is that despite the snide comments calling the Pentium 4 Extreme Edition the "expensive" or "emergency" edition, the P4 EE remains the fastest CPU in town. Indeed, we were pretty impressed by the chip in our three-way showdown ("CPU Slugfest," December 2003). Now at 3.4GHz, the chip is even more dominating. In almost every benchmark, the P4 EE pulled away from AMD's Athlon 64 FX and made a mockery of the 3.2GHz Prescott. In application tests, the P4EE took a pasting only

Shooting the Pipeline

	CPU	2.2GHz Athlon 64 FX-51	3.4GHz Pentium 4 Extreme	3.2GHz Pentium 4 Extreme	3.2GHz Pentium 4 Prescott
SYSmark 2004 Applications	Overall	172	202	187	185
	Internet Content Creation Overall	200	230	214	213
	3D Creation	193	220	205	203
	2D Creation	244	282	260	257
	Web Production	170	195	183	185
	Office Productivity Overall	148	177	163	160
	Communication	143	159	145	143
	Document Creation	177	213	196	178
	Data Analysis	127	164	153	161
Synthetic	Photoshop 7.01 MPC All Filters (sec)	288	259	263	304
	Mathematica 5 (sec)	551.3	612.8	646.6	703.1
	Premiere Pro video render (sec)	742	520	552	546
	MusicMatch 8.1 (sec)	281	231	242	275
	Sisoft Sandra 2004 RAM INT (MB/s)	5648	4712	4688	4802
	Sisoft Sandra 2004 RAM Float (MB/s)	5569	4694	4677	4811
Open GL	ViewPerf 7.1.1 3Dsmax-02 (fps)	12.85	13.04	12.87	13.16
	ViewPerf 7.1.1 Dvr-09 (fps)	42.89	36.69	36	39.75
	ViewPerf 7.1.1 Dx-08 (fps)	81.92	83.62	82.05	84.92
	ViewPerf 7.1.1 Light-06 (fps)	15.80	15.86	15.4	14.42
	ViewPerf 7.1.1 ProE-02 (fps)	15.32	15.11	14.82	15.05
	ViewPerf 7.1.1 UGS-03 (fps)	24.99	23.66	23.04	23.65
Games	3DMark03 340 Overall	5879	5924	5879	5843
	3DMark03 340 CPU	820	841	798	734
	3DMark2001 SE Overall	19900	19951	19613	18303
	AquaMark 3 CPU	9902	10546	10241	9683
	Halo 1280x1024	33.75	34.33	34.2	36.1
	Quake III Demo 4	417.8	458	439.6	361.7
	Jedi Academy	85	94.4	90.8	90.7
	Comanche 8x6	68.9	73.12	69.6	54.37
	UT2003 Demo Fly-by 8x6	306	290.9	282.2	246.4
	UT2003 Demo Botmatch 8x6	99	95.3	90.5	80.6

*Red denotes highest score

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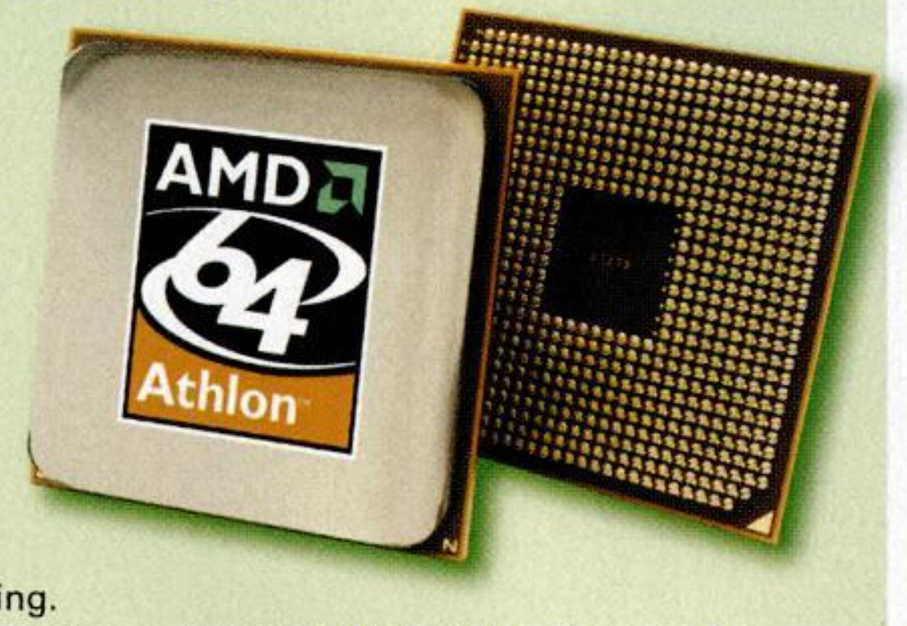
The Competition

AMD 2004: steady as she goes



AMD's Athlon 64 series may be the only desktop CPUs supporting a feature in Microsoft's upcoming Windows XP Service Pack 2 that prevents buffer overflows.

Just about everyone agrees that AMD's Athlon 64 FX and Athlon 64 CPUs are a hit when you consider their price-to-performance ratios. AMD's big problem is making enough of the CPUs to sell at effective prices. Still, using a 130-nanometer process, both A64s are simply too big and too expensive to make in higher volumes.

This year, AMD will attempt to remedy this by rushing to get its own 90-nanometer process going. The first 90nm CPU, dubbed San Diego, will arrive sometime in the spring with clock speed projections in the 2.60GHz range. The CPU will also use a new Socket 939 interface which will allow the FX to use more common memory instead of hard-to-find registered RAM. Like Intel, AMD will eventually abandon the Socket 754 and Socket 940 interface for this new socket, but has pledged to support both older interfaces for a reasonable amount of time.

AMD's real ace in the hole for its CPUs is a feature called "execution protection," which is also known as "no execute," or simply "NX." Microsoft's upcoming Service Pack 2 for Windows XP (see page 13) will rely on the CPU's ability to mark regions of memory where code cannot be executed. Microsoft expects NX to help reduce the amount of buffer-overflow viruses and worms, such as the MSBlaster worm. The good news for AMD, and the bad news for Intel, is that NX apparently requires hardware support at the processor level. And so far, only 64-bit chips support it: Athlon 64, Athlon 64 FX, Opteron, and Intel's Itanium. Intel's official word is that it is "evaluating supporting this feature in our client products." We take that to mean "no" or "not yet." With security becoming a bigger and bigger issue, you can bet Intel is scrambling to include some kind of support for NX.

"My sense is that Intel was blindsided by it," says analyst Rob Enderle of the Enderle Group, who wrote about the issue last year. Enderle says NX capabilities will be a big selling point of the A64 this year—especially to corporate users, who tend to be a bit more paranoid about security.

Finally, AMD should also see a Windows OS for its 64-bit CPUs sometime this summer or fall. We hope.

in *Mathematica 5.* That's no shocker—the Athlon XP and Athlon 64 simply have better floating-point performance.

Surprisingly, Prescott pulls out a victory over both P4EE and A64FX in *Halo.* Unfortunately, faster *Halo* frame rates are about the only good news for the CPU in gaming. In general, the Prescott turns in pretty poor frame rates against the P4EE at the same clock speeds and the Athlon 64. The Prescott does hold its own in *SYSmark 2004,* though, and beat the mighty P4EE in *Premiere Pro.* Unfortunately, the P4EE smokes the Prescott in *MusicMatch, Photoshop, and Mathematica.*

Against the Athlon 64, the Prescott only manages to eke out wins in columns favorable to the P4 architecture: *Premiere Pro, MusicMatch, Jedi Academy,* and *SYSmark 2004.* It wouldn't be fair to describe Prescott's performance as dismal because it performs pretty closely to two extremely fast CPUs, particularly in applications. Only in gaming does the Prescott flag.

Be that as it may, with all the tinkering Intel has done to the core, we expected better performance out of the Prescott, so we're disappointed. If there's a silver lining here, it's that Intel has at least managed to keep the chip close to the speed of the current Northwood core despite a much longer pipeline.

With this said, we fully understand that Prescott won't hit its stride until it gets to 4GHz or so, but at the end of all our testing, we couldn't help but wonder if performance really isn't the major reason why Intel rejected the Pentium 5 name. ■

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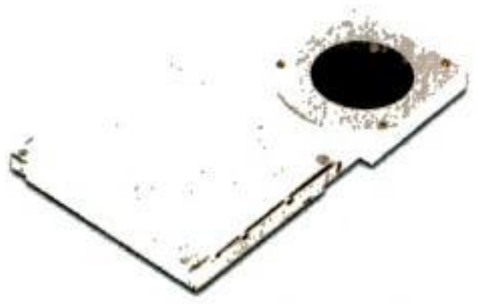
ACCESSID: MPC0304SM1

Area-51m Mobile Gaming

The Area-51m takes mobile gaming to the next level with innovative features like Do-It-Yourself Upgradeable Mobile Graphics Technology and optional built-in 802.11a+b+g wireless networking technology. Performance is better than ever with the availability of processors up to 3.20GHz, and the capacity for up to 2GB of PC-3200 memory. Backed by award-winning customer support, the Area-51m delivers the ultimate mobile gaming experience.

Do-It-Yourself Upgradeable Mobile Graphics Technology



The innovative Area-51m overcomes the technology barrier that has faced mobile gamers for years: graphics upgradeability. The Area-51m now features Do-It-Yourself Upgradeable Mobile Graphics Technology, a modular graphics solution described as "nothing short of revolutionary" by Maximum PC. This feature works similar to a desktop video card, allowing you to upgrade your system when new technology becomes available.

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Four Secrets to Wi-Fi

Anyone can add a wireless network to their home quickly and easily. But if you do it the *Maximum PC* way, you'll own the fastest, most reliable, and most secure network on the block

BY WILL SMITH

Without a doubt, wireless networking is the easiest way to share Internet access. And finally—*finally*!—the technology has emerged from the realm of the mundane corporate IT weenie to occupy the living rooms of regular folks. Anyone who wants Internet access throughout his or her house, or who's fed up with the Ethernet cables running into the living room for his or her game console can use Wi-Fi.

The Wi-Fi elite don't want you to know this, but all you need to get a wireless network running is an access point (AP) and a wireless card. Most wireless access points also include a router, which lets you share a single Internet address with all the computers in your home. It's really that simple. If you still need some more reassurance, turn to page 40, where we show you everything you need to know.

Although the new generation of wireless devices (more on them later) are a snap to configure and use, setting them up can still be intimidating to the uninitiated. And if something goes wrong—well, look out. If you're having trouble getting your wireless network up and optimally running, we've included a troubleshooting guide on page 43.

And no Wi-Fi setup is complete unless you've taken the time to secure your connection from evildoers. After all, you don't want your neighbors to mooch off of your expensive broadband connection just because you didn't read our security guide on page 44.

Ready to learn about wireless? Turn the page and we'll hook up your hardware, optimize your network, and get you on the road to wireless bliss.

Browse the net from anywhere in your house

This is the number one reason most people buy into wireless. Whether you're sitting on your couch or lounging in bed, you can still connect to the Internet. It's so handy, it's hard to imagine a time when there wasn't a laptop in the living room.

Shut out Wi-Fi banditos

Protect your wireless network from would-be Wi-Fi thieves by enabling WEP and preventing unknown wireless cards from connecting to your network. By using the Cantenna Wi-Fi booster (**www.cantenna.com**, $20), broadband thieves can pick up wireless signals from several hundred feet away. Don't be a victim.

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Wonder

Position your access point carefully

We mounted our access point on the central wall of the house. By mounting it vertically, we send most of the signal into the areas where we most need it—the downstairs bedroom, our office, and the living room on the other side of the wall.

Make any printer a wireless network printer

Using a handy $150 wireless print server, you can transform any USB printer into a network printer. In other words, you can print from any PC in your home and hide the printer in an out of the way location. The model pictured here is the SMC 2621W-U, which uses the 802.11b protocol. Alternatively, you can hang your printer off your central PC.

Watch out for wireless obstructions

Beware of walls that are made of cinder blocks, have steel studs, or contain a lot of pipes. These materials absorb and reflect radio waves, and will interfere with your signal.

Avoid naughty appliances

In addition to potential pitfalls built into the structure of your home, some appliances can also cause problems. Beware of refrigerators and microwave ovens in particular.

Connect everything in your living room

Without wireless, connecting a game console to the Internet is an exercise in frustration, and an OSHA-level work hazard. With a wireless bridge and the appropriate wireless gear, you can connect your consoles and even stream music, photos, and video from your main PC—all without wires.

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1 Set Up Your Wireless LAN the Right Way

Get your installation or upgrade right the first time with these tips, and you may never have to do it again!

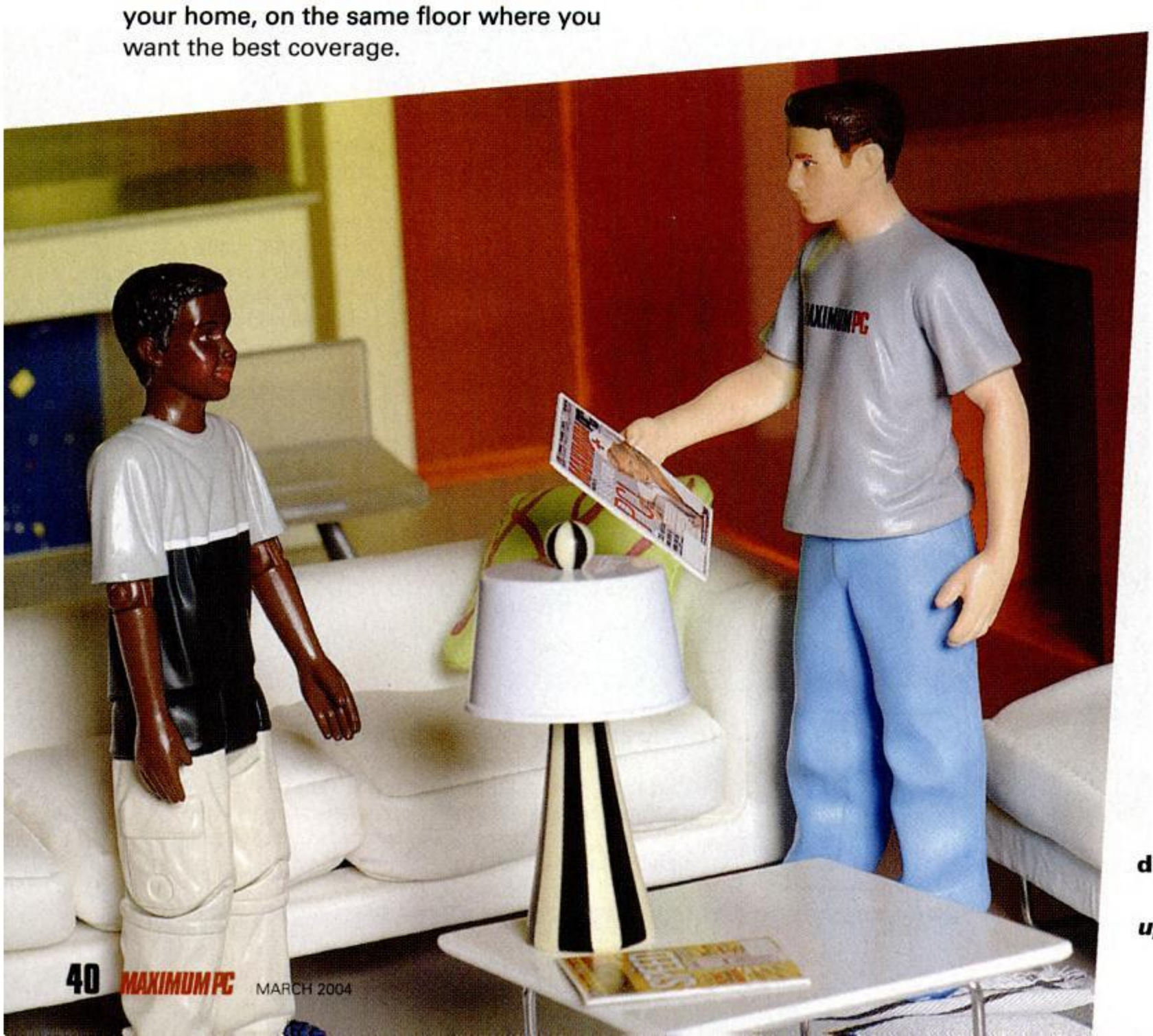
Nine times out of 10, setting up a wireless network is so simple, a baby could do it. However, the one time problems arise, they're usually more complex than a William Gibson novel. We've seen Cisco-trained engineers scratch their heads in dismay after a Wi-Fi install gone awry. The vast majority of problems can be avoided altogether—if you follow a few simple tips when you set up your network.

Proper placement is a virtue

Whether you purchase a fully fledged router and plan to use it to share your Internet connection with all the PCs in your home, or simply connect a wireless access point to your existing wired network, the most important thing you need to consider is the placement of the wireless AP in your home. When situating your access point, it's important to understand that the coverage area won't be a perfect sphere. Instead it will be flattened, with the access point in the center. Ideally you should place your AP near the center of your home, on the same floor where you want the best coverage.

In addition to the physical location of your access point, beware of typical signal-killing pitfalls. Anything dense can impede reception. In most homes, this means concrete and metal walls, but we've even seen densely packed bookshelves ding Wi-Fi performance. Many appliances, such as refrigerators, ovens, microwaves, or anything with an electric heating element or compressor, create strong electric fields that adversely affect your signal quality.

Once your AP is installed and configured according to the manufacturer's directions, test the reception in different areas of your home. You can use a fancy Wi-Fi signal meter, but a Wi-Fi equipped laptop works just as well. If your card comes with site survey software, you can use it to measure your wireless network's signal strength in different areas of your home. If it doesn't, you can use the monitor that's built into Windows. Go to Control Panel, then Network Connections, then right-click your wireless network card and go to Status. Take the laptop to each room you'll want to connect from, and check the signal meter. Green and even yellow signals are acceptable, but any signal in the red will work inconsistently, which will quickly become annoying.



Say no to low signal strength

You have several options if you've got the low-signal-strength blues. The easiest and cheapest trick is to relocate or reorient the access point. Leave your test laptop in the trouble spot, then move your AP a few feet and recheck the signal strength in the trouble spot and the rest of the house. (Make sure you check your other points as well before you make the new location permanent.)

But what happens if relocating the access point does no good? If you've tried several different rooms and have avoided every potential trouble spot, you may need to purchase some additional hardware. Signal boosters and repeaters will add range to your wireless LAN, but in slightly different ways. Most signal boosters are vendor specific, and connect directly to your access point, expanding the range it covers.

Repeaters, on the other hand, add another coverage bubble to your LAN's range. They usually work with any brand of access point, and can be placed anywhere within your existing coverage area. For about the same price, we've had better luck using repeaters instead of signal boosters. It seems the hardware vendors have found the same to be true, because very few companies are still producing signal boosters. For best results, we recommend you place your repeater at the edge of your access point's acceptable coverage area, and nearest the rooms that need improved connection quality. We like D-Link's DWL-800 repeater.

In addition to access points, routers, repeaters, and signal boosters, Wi-Fi bridges are useful for connecting wired Ethernet devices to your wireless network. Most bridges available today are used to convert wired game consoles and other consumer electronics devices into wireless ones.

"Hey, Readerman, you look different. Are you using Viagra?"

"No, but my Wi-Fi network is *up* and running!"

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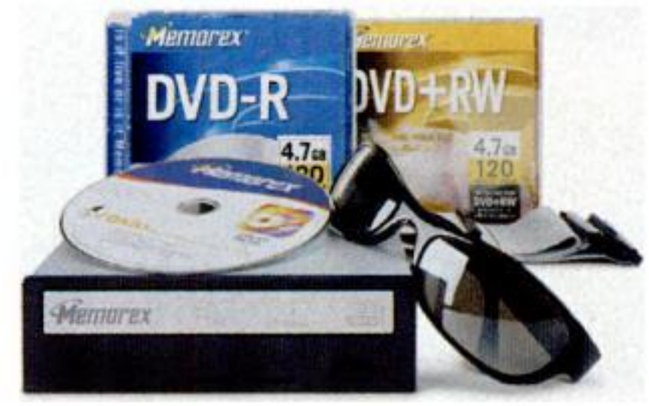

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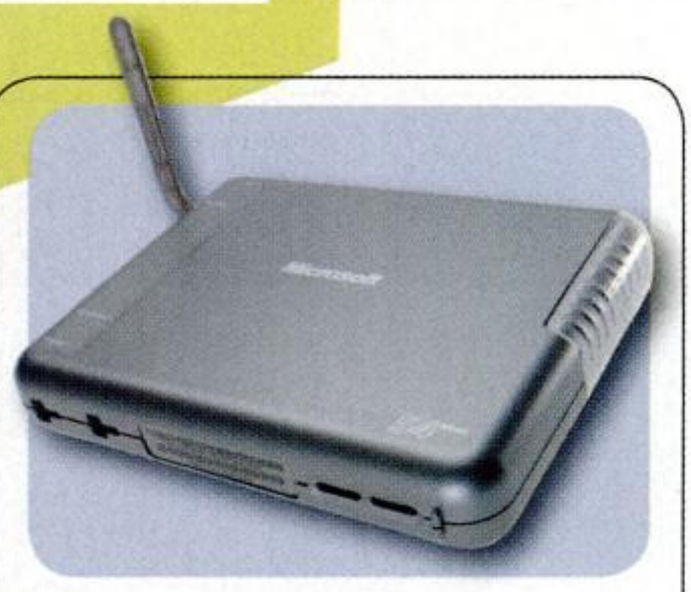
2 Buy the Best Products

From access points to routers to webcams, here's the *Maximum PC*-approved list of the best Wi-Fi gear for every category. Our verdicts are law!



Easiest Router to Install
Microsoft Wireless Base Station MN-700

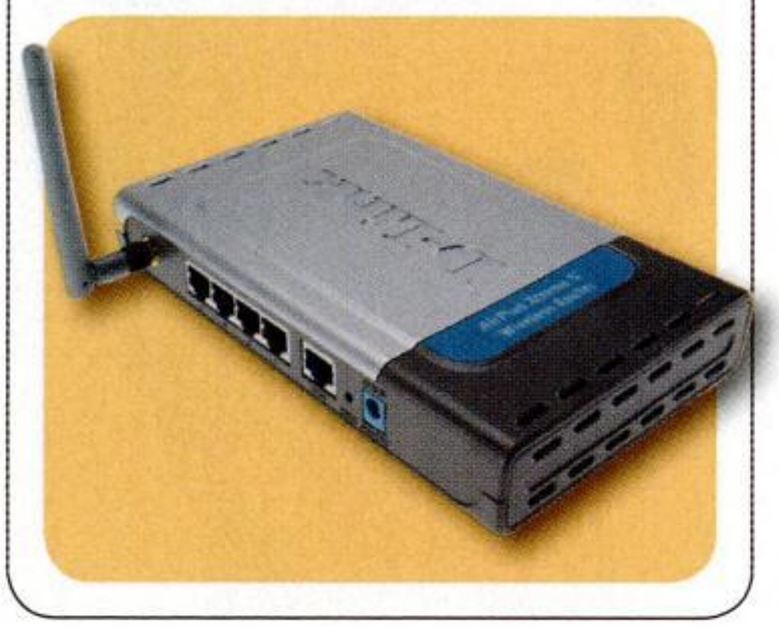
This 802.11g router is more enjoyable to configure than any other router we've ever used. It walks even the rankest neophyte through the Wi-Fi configuration process, helping you choose the correct settings for security and reliability. This integrated four-port hub even lets you share your broadband hookup with all the devices in your home, whether they're wired or wireless.

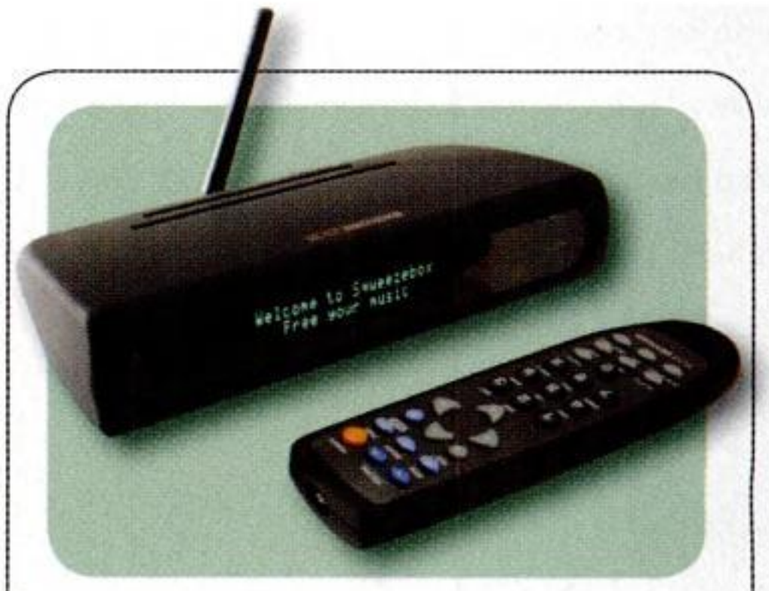
$110, www.microsoft.com/hardware

Fastest Router
D-Link DI-624

By day, the DI-624 is an ordinary Wi-Fi router with a four-port hub that runs at a measly 54Mb/sec. But when you engage its special High Speed mode, it ratchets the speed up to 108Mb/sec by using more of the available spectrum. As long as you'll be using it with other D-Link devices in your home, the DI-624 is the ultimate router for high-speed wireless access.

$120, www.dlink.com





The Ultimate Streaming Media Box
Slim Devices Squeezebox

You've got thousands of MP3s on your PC, but no way to listen to them on the kick-ass stereo in your living room. This common problem is easily solved with a simple Wi-Fi network and the Squeezebox. Setup is easy; install the software on your PC, power up the Squeezebox, connect it to your stereo using either the analog or digital connection, enter your SSID and WEP key, and you're ready to groove. The easy-to-browse interface and web-based configuration tool let the Squeezebox stream much more than just MP3s; it can stream any audio format your PC can play. For more information, see a full review on page 70.

$300, www.slimdevices.com

Best Wi-Fi Webcam
D-Link DCS 2100+

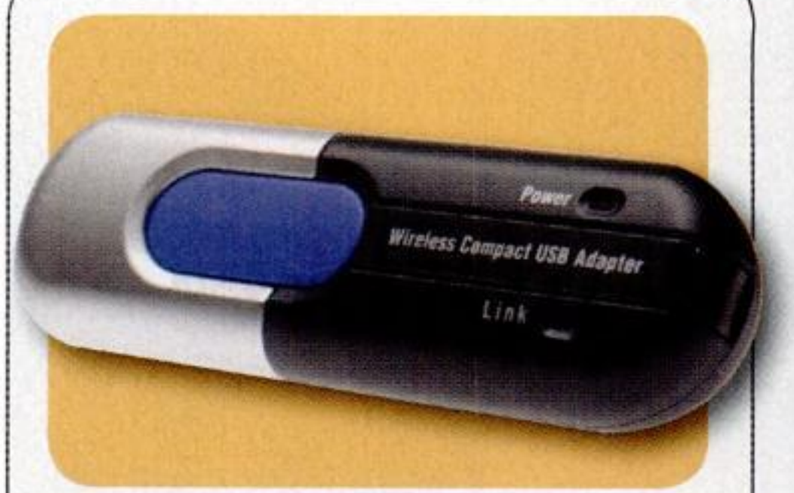
It really doesn't get any simpler than the DCS 2100+. You plug it into an electrical outlet, configure it from any Wi-Fi enabled PC using the provided software, and you instantly have a webcam that you can place anywhere in range of your Wi-Fi access point. It can even stream a 320x240 MPEG4 video at 30 frames per second. It makes for a great little security device.

$380, www.dlink.com

Wi-Fi PC Card

The vast majority of Wi-Fi cards for laptops are virtually identical. Most have about the same performance, cost about the same price, and are made by the same two companies: Broadcom and Intersil. The only reason to choose one Wi-Fi card over another is that some vendors, like D-Link, enable higher-than-standard wireless transfer speeds on only their own hardware. For this reason, we recommend buying your PC cards from whichever company made your access point.

Around $50



Most Portable Wi-Fi Device
Linksys WYSB12

This penlight-size USB dongle adds Wi-Fi in seconds to any PC with a USB port. Its small size and convenient formfactor make it an easily transportable Wi-Fi solution for desktops or any other device with a USB port.

$70, www.linksys.com

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3 Logically Troubleshoot Your Wi-Fi Woes

We present three easy steps to wrangle your Wi-Fi network into working order

Typically, setting up a Wi-Fi network is so easy, a poorly trained dyslexic monkey could have the whole thing up and running in 15 minutes. Of course, those rare instances when everything goes wrong can be frustrating for even a highly trained network engineer. Follow these steps to tackle even the gnarliest Wi-Fi mess.

PROBLEM:

My PC shows a strong signal, but I can't connect to the Internet.

WE SAY:

Three or four factors can cause a connection with no data transfer. First, try upgrading your access point's firmware. We've spent hours trying to configure and re-configure a dead Internet connection, only to discover that a firmware update was all we needed. (The firmware is like your access point's operating system.)

If that doesn't work, check for a misconfigured WEP (wired equivalent privacy) or WPA (Wi-Fi protected access) key. If you have other wireless PCs that are operating properly on your network, re-enter your WEP or WPA key on the machine that's not working.

If you live in an apartment complex with several other wireless access points, you may need to prevent your PC from connecting to other APs. Go to Start, Control Panel, Network Connections, then right-click your wireless network card and choose Properties. Go to the Wireless Network tab, then click the Advanced button and ensure that "Automatically connect to non-preferred networks" is not checked.

The final potential pitfall is an IP address misconfiguration. Go back to the Network Connections Control Panel, right-click your wireless network card, and then select Status. Go to the Support tab and check the IP address. For most IP addresses, the address type should be listed as "Assigned by DHCP." If that field lists "Auto-configuration IP address," it's easy to fix. Just press the Repair button to get a current dynamic address.

If the address-type field says "Static IP address," you'll probably need to change it to dynamic. First click Network connections, and press Properties. Click the General tab, then double-click the Internet Protocol item. Make sure that "Obtain an IP address automatically" and "Obtain DNS server address automatically" are checked.

PROBLEM:

My access point is on and configured, but my wireless computer says there's no available wireless network.

WE SAY:

First, try moving your computer closer to your access point. If you're sitting three feet away from the AP and don't have a connection, either your device or the AP is misconfigured. Make sure your access point and PC are using the same type of security, either WPA or WEP. You also need to ensure that the security key is the same on the AP and the PC.

Make sure your card and access point are using the same spec. While 802.11g is backward-compatible with 802.11b, some access points allow the user to lock the AP into 802.11g-only mode, preventing connections from older 802.11b hardware.

If you've checked the security and compatibility settings, but still have no connection, check your AP manufacturer's web site for a firmware update. Many times, incompatibility issues between access points and wireless networking cards can be quickly resolved with firmware updates.

"Many times, incompatibility issues between access points and wireless networking cards can be quickly resolved with firmware updates."

PROBLEM:

I've tried everything above, but I still can't connect to the Internet.

WE SAY:

Either your Internet connection is down, or your router isn't talking to the Internet via your Internet Service Provider. If your access point is built into a router, make sure the router is actually working by plugging a PC into one of the wired Ethernet ports. If you can't connect using the wired port, then your router may be misconfigured. Make sure your router is configured as your ISP recommends. Check the IP address and your PPPoE settings. Some ISPs used to tie your connection to a single MAC (media access control) address, but that's increasingly rare. If you're concerned that there's some ISP funny business going on, check your access point's documentation to see how to clone your desktop PC's MAC address onto your router.

If it still doesn't work, try connecting your PC directly to your DSL or cable modem. If you can connect to the Internet when plugged directly into your modem, then your router is misconfigured. If you can't, contact your ISP to get your broadband connection working properly.

In the Lab: How to test Wi-Fi performance

We use several benchmarks to test Wi-Fi performance, but the simplest method is to measure the length of time it takes to move a large file from a wired machine to a wireless machine and then back again. We use an FTP server for our tests, but it's entirely acceptable for a home user to just use Windows file-sharing by dragging and dropping files between directories. To test performance, you'll need a stopwatch and a file larger than 200MB. When the file is finished transferring, divide the size of the file by the length of time it took to download. We generally find 802.11g networks transfer at about 1.2MB/sec, or about 10Mb/sec, from a wired to wireless network in a best case scenario.

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4 Tighten Up Your Network's Security... Today

Make your wireless network as secure as possible, or you will eventually suffer the consequences

The bad news is that there's no way to completely protect a wireless network from intruders. It's just not possible. Your access point constantly broadcasts its signal wirelessly, and anyone in range with enough time and expertise will be able to break whatever security you put into place. In a best case scenario, they'll leech bandwidth from you. But they'll also gain access to any files you've shared on your PCs. That means they can gank last year's tax return, or worse, the video you made to commemorate that very special Valentine's Day.

The good news is that it takes a lot of effort and some specialized hardware and software to break into a wireless LAN. In a perfect laboratory environment, it takes a day or more to collect enough data to crack one WEP key. In a real-world situation, it can take several months.

Luckily, there's more you can do than just changing the AP's password. Today's access points come with the tools you need to keep all but the most determined crackers out.

Enable WEP or WPA

The first action you should take is to enable WEP or WPA on your access point. WEP and WPA encrypt every single transmission over your wireless network, from harmless requests for a dynamic IP address to the contents of the files you download over *Kazaa*. WEP is the original encryption standard for Wi-Fi networks. Newer Wi-Fi hardware also supports WPA, which provides a higher level of protection, but isn't supported by all wireless hardware. At the bare minimum, you should enable a 128-bit WEP key for your wireless network. Don't keep telling yourself you're going to do it. Do it today!

Enabling WEP isn't enough to protect your network, though. You need to make sure the WEP key is sufficiently random. Because a 128-bit WEP key is difficult to remember, many people use an easy-to-remember series. This is bad; WEP keys that aren't random are very easy for anyone to pick out and decrypt. To create a truly random WEP key, you can do one of several things. You can mash random letters and numbers on the keyboard until you've created a 26-digit key. You can roll three dice and use the value of the dice to determine each digit of your key. Or you can use a simple random number generator. Several are available at **www.download.com.**

Make your wireless clients inaccessible to the rest of the Internet

One of the main techniques evildoers use to crack Wi-Fi encryption keys is to send massive amounts of data across the wireless network, then use that traffic to suss out the network's WEP key. By sending millions of ping requests to a wireless computer, they can generate enough traffic to crack some WEP keys in as little as 18 hours. However, if they can't connect to your wireless computers from the Internet, all they can do is sniff normal day-to-day traffic. This takes considerably longer. Make sure your wireless PCs have private IP addresses that are inaccessible to the rest of the net. Private IPs usually start with 192.168 or 10.15.

Prevent unauthorized computers from connecting

Every network card has a unique identifier built in. This number is called the MAC address. Most access points allow you to limit connections to computers with known MAC addresses. If you manually input the MAC address for each of the computers you intend to connect to your wireless network, it will be much more difficult for someone to infiltrate your network. Check the documentation that came with your access point to find out how to manually input allowed MAC addresses. Note that you can get the MAC address (also called the physical address) for your PCs by going to the Network Connections Control Panel, right-clicking your network card, and choosing Status. Then go to the Support tab and click Details. The Physical Address entry is that network card's MAC address.

Change your WEP or WPA key regularly

It's a pain, but take the time to change your WEP or WPA key once or twice a month. By occasionally changing the encryption key, you can prevent anyone from collecting enough data to gradually reverse engineer any one of your keys.

Big words are scary: Here's what they all mean

ACCESS POINT: The access point is the interface between a wired network and a wireless network. Properly configuring the access point is the key to a good wireless experience. An improperly configured AP will leave your network open to attack.

ROUTER: A router will let you share the single IP address that your Internet provider assigns you with all the computers on your network.

BRIDGE: A bridge lets you connect two different types of networks. The bridges we mention in this story convert wired Ethernet devices into wireless Wi-Fi devices.

WI-FI: The Wi-Fi logo on a piece of wireless hardware denotes full compatibility with other Wi-Fi hardware. Originally, Wi-Fi only encompassed the 802.11b spec, but later came to include both the 802.11a and 802.11g specs as well.

802.11A: A successor to the original 802.11b protocol, 802.11a uses the unlicensed 5GHz frequency range for data transfers. Most 802.11a products are not backward-compatible with 802.11b, although there is some new multi-band hardware that supports 802.11a, 802.11b, and 802.11g. 802.11a moves data at 54Mb/sec.

802.11B: The original Wi-Fi protocol, 802.11b uses the unlicensed 2.4GHz range. It runs at up to 11Mb/sec and is the gold standard for wireless access.

802.11G: Another Wi-Fi protocol, 802.11g uses the same frequency range as 802.11b, but runs at a 54Mb/sec compared with 802.11b's 11Mb/sec. 802.11g hardware is backward-compatible with 802.11b hardware.

802.16A: Also known as WiMax, 802.16a promises wireless broadband with a range of up to 30 miles. In early 2005 expect to see the first WiMax networks set up in rural areas that lack good DSL or cable coverage.

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7 Unbelievably Cool Wi-Fi Tricks

Wireless networks aren't just for browsing the Internet in your living room anymore

1 Stream music to any room in your home

With the Squeezebox (reviewed on page 70) you can convert any old stereo into a jukebox storing every single CD you own. By housing your MP3s on one machine and streaming them to every other room in your house wirelessly, you'll be able to stop worrying about managing your music, and just enjoy it.

2 Get rid of the Ethernet cable from your Xbox to your cable modem

Whether you're into the Xbox, PS2, or Gamecube, you can play countless console games online. With a wireless bridge, you can connect any number of wired Ethernet devices to your wireless LAN.

3 Become your neighbor's ISP

Some cutting-edge Internet Service Providers have set up infrastructure to allow users to share their DSL connection wirelessly. This gives your neighbor a fast, cheap connection and can save you money on your monthly DSL bill. Speakeasy (**www.speakeasy.net**) started doing this first, and the company even provides the hardware to get your shared connection up and running.

4 Set up a network of Wi-Fi webcams

Ever wonder what your cat does during the day while you're at work? Connect a wireless webcam—or three—and check in on Mittens from work.

5 Participate in a community Wi-Fi network

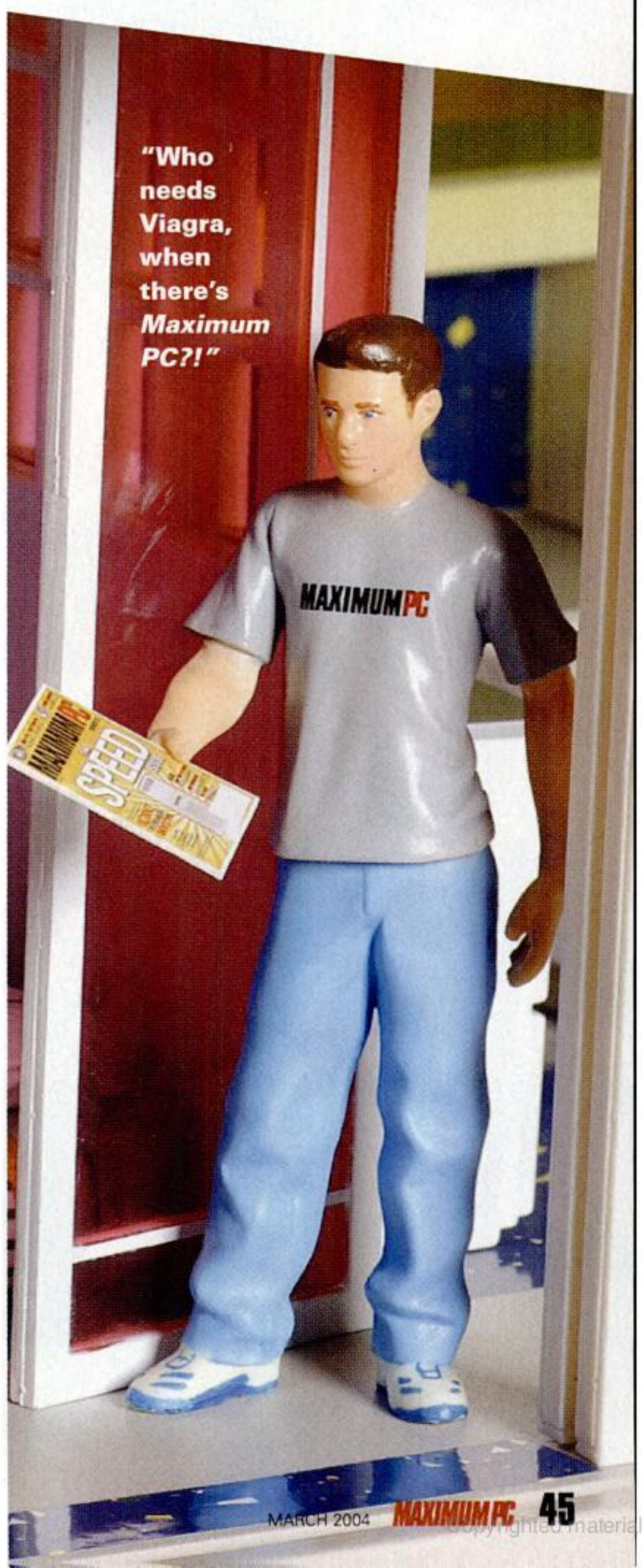
If you're feeling generous, most major cities have free wireless LANs. You can configure your access point so that any passerby who needs a net connection can tap into your broadband. You don't get anything in return, besides the warm, fuzzy feeling that giving provides. Do it for the kids.

6 Make free (or maybe just really, really cheap) phone calls

Voice over IP (VoIP) calling gives you a super-cheap way to make long distance calls over the Internet. With a wireless handset and the right software, you can even VoIP wirelessly.

7 Cook dinner

New ovens will be available later this year that have wireless connections to the Internet. What does that mean for you? Because the oven also includes a cooling element, you can put a casserole in the appliance in the morning before you leave for work, keep it chilled all day long, and then log in to your oven at 3:00 pm to let it know you'll be home on time, so it can commence cooking your covered dish. ■



...And 3 Incredibly Dumb Tricks

1 Bathtub surfing

No matter how good an idea it seems, laptops and bathtubs just don't mix. Sure you can fire off an e-mail while your conditioner sets in, but you'll never be able to get the suds out of your portable PC. And if it's plugged in, you'll never be able to get the life back into your body.

2 Don't transfer large files

Wired networks are significantly faster than wireless, which is really apparent when you transfer files larger than a couple hundred megabytes.

3 Don't oversaturate your AP

Don't try to connect too many people to your access point. The maximum rated bandwidth of a wireless AP is shared among all the users of your wireless LAN. If you have more than 12 or 15 people, even 802.11g networks will begin to bog down.

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Welcome to Paradis

Battle the most complex enemy A.I. ever experienced.

Engage in extreme long-range gunplay with Far Cry's 800-meter scalable view system.

Use any array of combat tactics, from close-quarters combat to vehicular mayhem in single and multiplayer modes.

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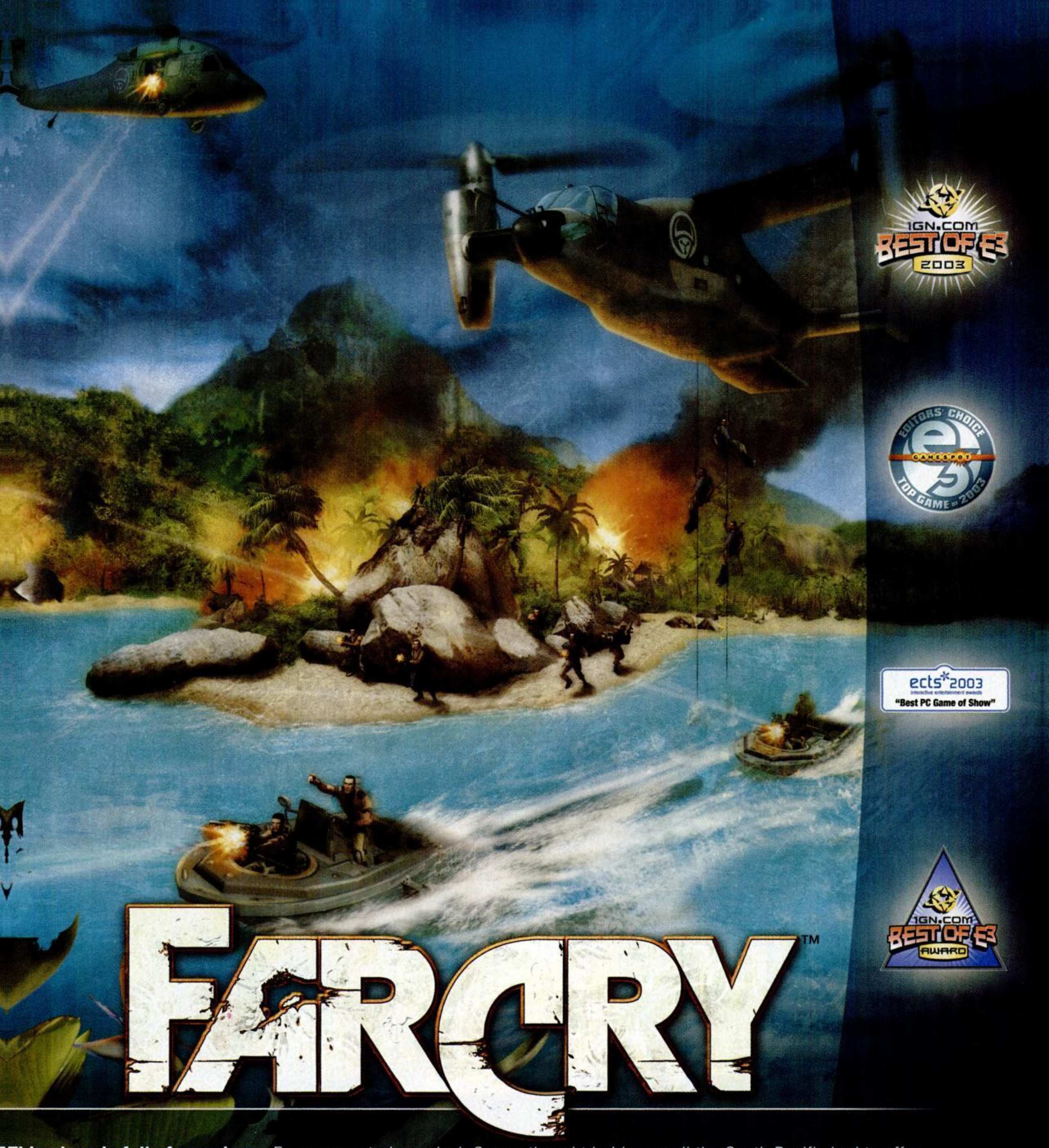

FARCRY™

This place is full of surprises. Ex-ocean patrolman Jack Carver thought he'd seen all the South Pacific had to offer – gruesome mutinies, boat-devouring typhoons, even a few bizarre Micronesian fertility rites. But nothing prepared him for what he's uncovered on this island. Radically equipped mercenaries are just the beginning of this getaway gone to hell. Watch your back, Jack, or you'll lose more than just your luggage.

MATURE 17+ M CONTENT RATED BY ESRB — Blood, Intense Violence

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The Bionic Librarian: Memory access can be boiled down to a three-stage process. After the correct information is located among the vast volumes contained in RAM, the "librarian" must wheel over to the correct row and column (1). Then, the librarian grabs the correct volume, and replaces it with another volume, and notes its location (2).

RAM

All Questions Answered!

BY MARK EDWARD SOPER

illustration by Dave McKay ©2004

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We explain everything you need to know about RAM, including how it works and why some memory works better than others

RAM. It's short for random-access memory, and you already know the basics: Your system can't run without it; Windows XP should have at least 256MB, but 512MB is better; and faster RAM can improve system performance if your system is designed to use it.

But how well do you really understand memory? In this article, you'll learn how memory works, how your BIOS and chipset combine forces to manage memory access, and the prospects for current and emerging memory technologies, from SDRAM and RDRAM to DDR2.

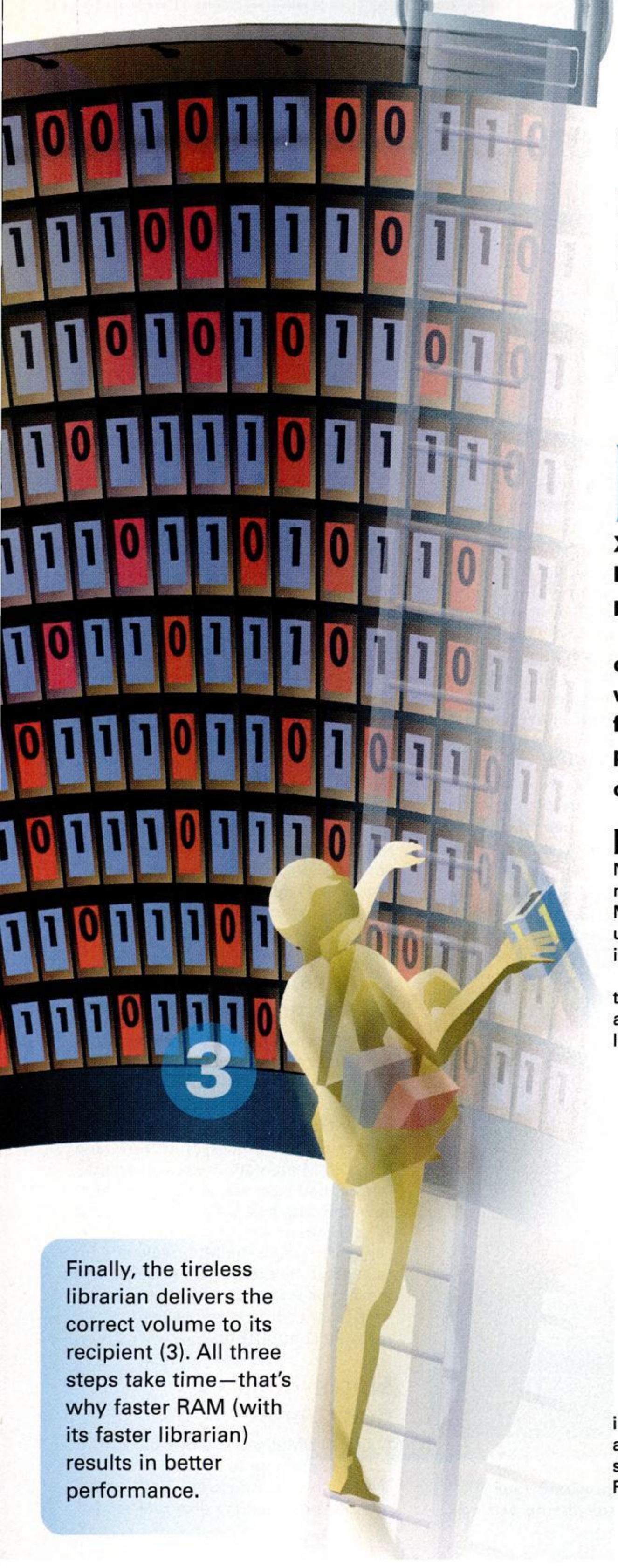
How RAM works

No matter how much RAM is installed in your PC, it's organized much like what *Maximum PC* Senior Editor Gordon Mah Ung calls a "big-ass spreadsheet" with rows and columns of data. However, to understand the process of accessing memory, a second analogy is useful.

Imagine RAM locations as books in a very elegant library that uses a ladder attached to the top of the shelves for access. The process of getting a particular book in such a library works like this:

1. **Locate the book.**
2. **Roll the ladder to the correct set of shelves.**
3. **Go up the ladder to get the book or books off the shelf.**
4. **Put away any books that go on the shelf.**
5. **Go down the ladder with the book(s).**
6. **Give the book(s) to the reader.**

Just as the process of retrieving or returning a book involves delays in moving from one set of shelves to another (rolling the ladder) and then reaching the correct shelf containing the book (going up and down the ladder), RAM access is delayed by moving from one row of memory →



Finally, the tireless librarian delivers the correct volume to its recipient (3). All three steps take time—that's why faster RAM (with its faster librarian) results in better performance.

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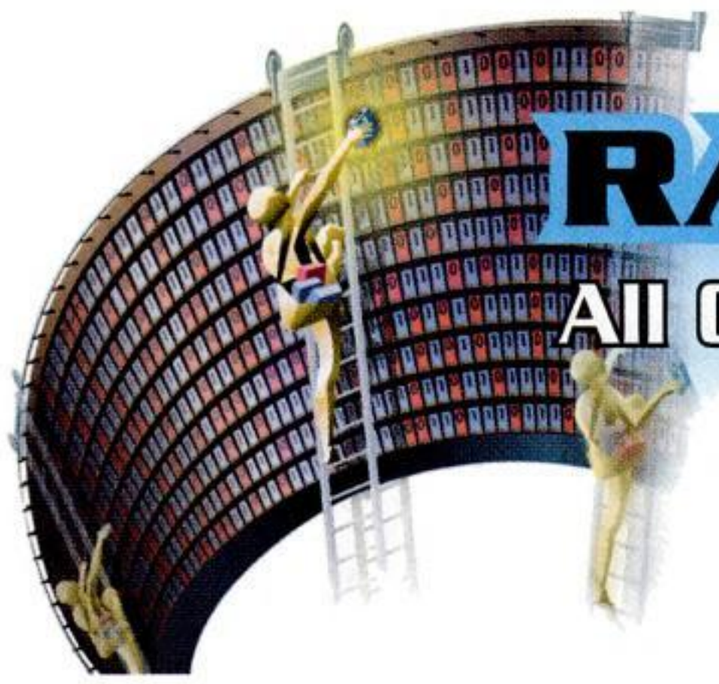

RAM: All Questions Answered!

addresses to another, and from locating the correct row/column address of the information needed from RAM.

And just as the librarian fetches books for the reader, the processor uses the memory controller (usually part of the northbridge or memory controller hub chip) to access memory locations. Although the AMD Opteron, Athlon 64, and 64 FX processors feature built-in memory controllers, the principle is the same.

Adjusting RAM access performance with CMOS/BIOS settings

You might not be able to control how quickly the librarian gets you a book, but you can adjust the speed of RAM access in two ways: by buying memory with a faster speed rating (assuming your motherboard supports faster RAM) and by adjusting the memory timings in the chipset setup menu found in most CMOS/BIOS programs.

In the BIOS setup menu, RAM access performance is indicated in clock cycles. By default, the memory module's serial presence detect (SPD) chip provides the motherboard with complete information about the module, including the default timing values the memory vendor deems appropriate for the memory chips on the module. Before you can tinker with memory timing, you need to disable the SPD setting in the system BIOS's chipset menu. Figure 1 shows a typical chipset menu using the default SPD setting, and Figure 2 shows the same menu with SPD disabled to allow user-defined memory timings.

When RAM is addressed by the memory controller, each row is activated. The memory addresses, represented by a row/column value, are read from or written to. The row is then deactivated, and the next row is processed. Memory timings control how quickly the memory controller processes each row of memory. The faster the controller processes the data in memory, the faster your PC moves.

Table 1 (page 52) lists the memory timing parameters in the order each operation is performed during memory access.

As you can see from Table 1, the CAS Latency value (often the only memory module value mentioned in catalog listings, other than clock speed) is just one small part of the memory timing picture. Memory timing is sometimes listed as 2-3-3-7-1T. Figure 3 (page 53) indicates what these values mean, using the terminology described in Table 1.

Generally, the smallest value possible for each parameter in Table 1 (that still allows the system to run without crashes or instability) is recommended for maximum speed. The tests performed by Harry Lam at TechwareLabs.com (**www.techwarelabs.com/reviews/memory/memory_timings/**) are a good example of how to compare the effects of different combinations of timing values. In his report you'll get an idea of what kind of return to expect from different settings.

```
AMIBIOS NEW SETUP UTILITY - VERSION 3.31a

DRAM Timing Control                          [ Setup Help ]

Current Host Clock                 133 MHz
Configure SDRAM Timing by          SPD
  SDRAM Frequency                  Auto
  SDRAM CAS# Latency               Auto
  Row Precharge Time               Auto
  RAS Pulse Width                  Auto
  RAS to CAS Delay                 Auto
  Bank Interleave                  Auto
DDR DQS Input Delay                Auto
SDRAM Burst Length                 4 QW
SDRAM 1T Command                   Disabled
Fast Command                       Normal
Fast R-2-R Turnaround              Disabled

F1:Help      ↑↓:Select Item      +/-:Change Values      F7:Setup Defaults
Esc:Previous Menu                Enter:Select ▶Sub-Menu  F6:Hi-Performance
```

Figure 1: In order to tweak the speed settings of a RAM module, you must first disable SPD (serial presence detect) in the BIOS, which prevents your motherboard from automatically detecting the module's default timing settings.

Understanding banks of memory

When you add memory to a new motherboard or upgrade an existing system, the memory must be added in banks. A memory bank refers to the amount of memory, in bits, which matches the data bus of the processor. SDRAM and DDR DIMM memory modules, regardless of their size, are 64 bits wide, and so is the data bus of Pentium 4, Athlon XP, and Athlon 64 processors. Thus, you can add a single DIMM module at a time to expand the memory of systems using these processors if the motherboard uses a conventional single-channel memory controller design.

Single-bank or dual-bank?

A single DIMM can add one bank or two banks of memory to a system. Dual-bank DIMM modules (these often have chips on both sides and are also referred to ➔

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Some people are kinda nuts. Their malformed cerebrums (that's 'brains' for those of you who skipped Bio class) compel them to game wherever they can. Hey, we're kinda nuts ourselves. That's why our portable Super LANBOY case packs all kinds of gravity-defying goodies. Like a lightweight anodized aluminum body. A free carrying strap. Plus nine drive bays and two 120mm fans. So game wherever you want. Just use a safety net, OK? To learn how we can help you lift your game to a higher level, visit **www.antec-inc.com.**

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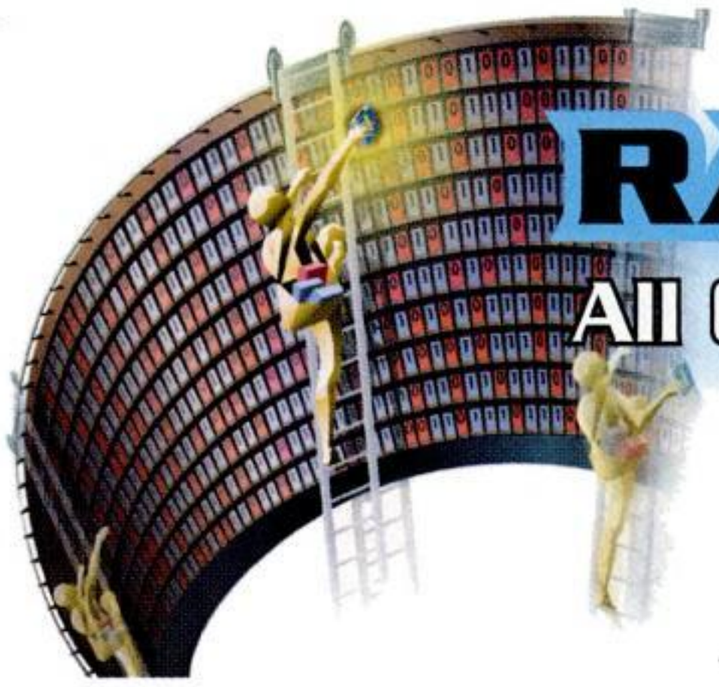

RAM: All Questions Answered!

as double-sided DIMMs) let you install more memory into a single slot and, in recent tests with high-speed overclock-friendly memory, improve performance over single-bank modules.

In rare cases, you may find motherboards with three memory sockets that use chipsets that support just four banks of memory. Thus, if two dual-bank/double-sided modules are already installed, you must leave the third socket empty. Some systems support dual-bank modules in slots 1 and 2, but slot 3 can use only single-bank memory.

Older systems designed for use with DDR266 (PC2100) memory might be less stable if you use nonstandard memory timings, but systems designed for DDR333 (PC2700) and faster memory usually work well with either standard or nonstandard memory timings, regardless of whether the modules are single-bank or dual-bank.

Memory Parameter	Common Abbreviation	What It Does	Range of Typical Values (in clock cycles)
RAS to CAS Delay	tRCD	Activates row	2 or 3
CAS Latency	CAS, CL	Delay between activation of row and reading of row	2, 2.5, 3 (DDR) 2, 3 (SDRAM)
RAS Precharge	tRP	Deactivates row	2, 3
Command Rate		Delay between chip select and command	1, 2
Active to Precharge Delay	tRAS	Number of clock cycles between activation and deactivation of row	3, 4, 5, 6, 7

Table 1: This table shows the most common memory parameters that can be tweaked in the BIOS, how they are often abbreviated in BIOS screens, what they affect, and the typical values they can be assigned.

Current memory technologies

The oldest type of memory in widespread use is PC133 (133MHz) SDRAM (synchronous DRAM). SDRAM performs one operation per clock cycle. (See RAM stats on page 55 for details.)

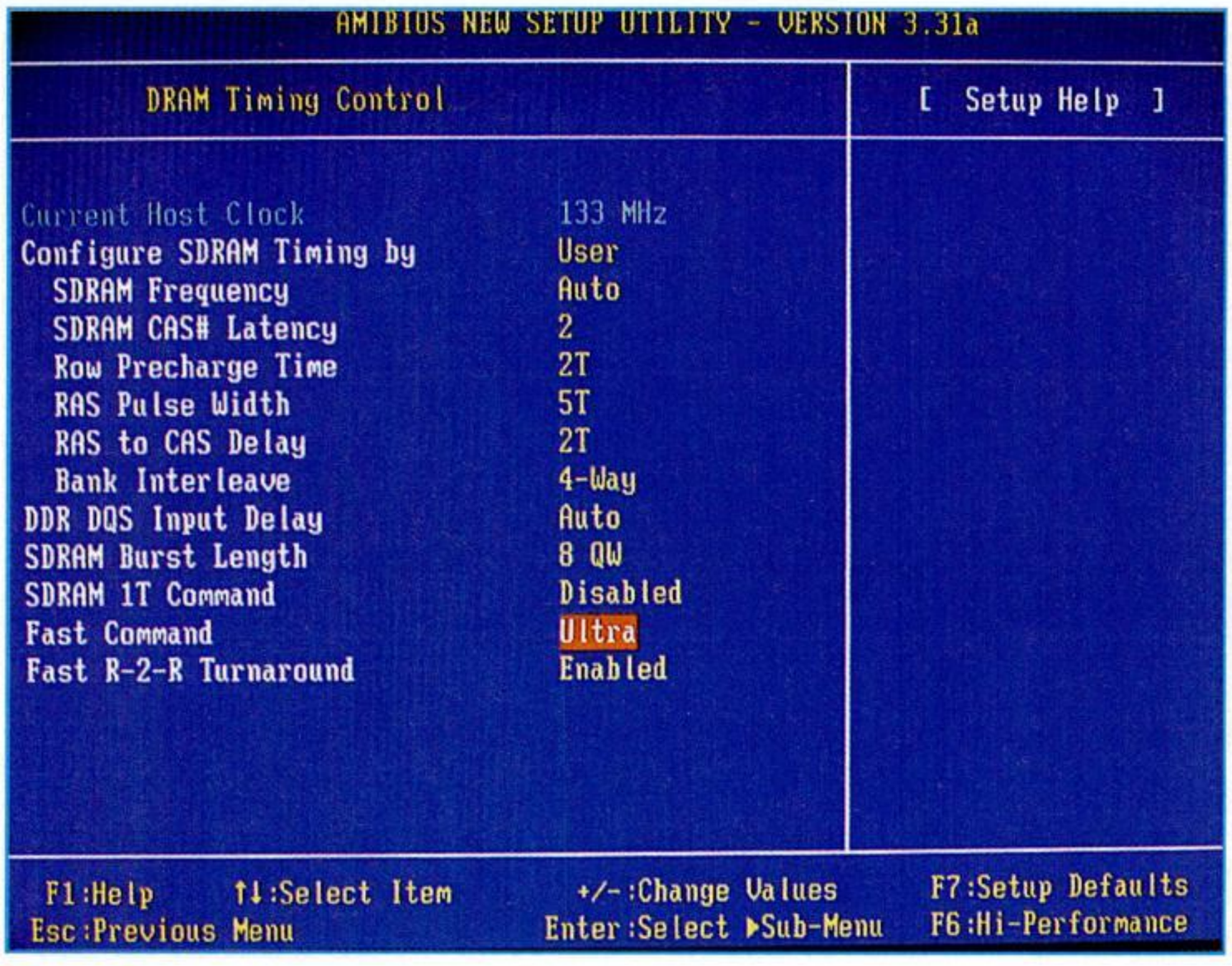
AMIBIOS NEW SETUP UTILITY - VERSION 3.31a
DRAM Timing Control
[Setup Help]
Current Host Clock 133 MHz
Configure SDRAM Timing by User
SDRAM Frequency Auto
SDRAM CAS# Latency 2
Row Precharge Time 2T
RAS Pulse Width 5T
RAS to CAS Delay 2T
Bank Interleave 4-Way
DDR DQS Input Delay Auto
SDRAM Burst Length 8 QW
SDRAM 1T Command Disabled
Fast Command Ultra
Fast R-2-R Turnaround Enabled
F1:Help ↑↓:Select Item +/-:Change Values F7:Setup Defaults
Esc:Previous Menu Enter:Select ▶Sub-Menu F6:Hi-Performance

Figure 2: Once you've disabled SPD, you're free to experiment with different settings—that is, as long as you've got a motherboard that permits it.

How to Improve Memory Performance by Adjusting Memory Timing

Generally, memory manufacturers are very conservative in their memory timings, so it pays to try tweaking your RAM settings, even if you don't overclock your system. In a series of experiments, we determined that the following adjustments gained us about 3 percent faster memory performance according to *SiSoft Sandra*: lowering the memory's default CAS latency from 2.5 to 2, lowering the RAS to CAS Delay from 3 to 2, lowering the RAS Precharge from 3 to 2, lowering the Active to Precharge from 6 to 5, and lowering the command rate from 2T to 1T. Your mileage, of course, may vary.

Given identical memory modules, the chipset used by a given motherboard is often the most important factor in determining how fast the memory subsystem is. Many motherboard and system reviews look closely at both the memory and the chipset. You should too.

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DDR (double data-rate) SDRAM, now the most common type of memory, performs two operations per clock cycle, so it can transfer data much more quickly than SDRAM. For example, DDR400 runs at a clock speed of 200MHz, but with two operations per clock cycle the effective speed of the memory is 400MHz. DIMM modules that use DDR chips are usually referred to by their throughput. For example, DDR400 memory has a throughput of 3.2MB/second, so memory modules using DDR400 RAM are usually referred to as PC3200 modules.

Some systems use Rambus DRAM (RDRAM) modules (RIMMs). Unlike SDRAM or DDR SDRAM modules, which perform parallel data transfers over a 64-bit data bus, RIMMs perform serial data transfers over a 16-bit data bus. Typical RIMMs contain up to 32 devices (chips), and data transfer takes place from chip to chip within the RIMM. Until recently, the most common RIMM was the RIMM1600 (also called PC800) 16-bit RIMM. However, some recent chipsets, such as those from SiS, support faster and wider RIMMs. Currently, the most popular RIMM runs at 600MHz and combines two channels into a single 32-bit module. It's referred to as RIMM4800 for its 4.8MB/second throughput.

RIMMs, unlike standard DIMMs, have always used heat spreader plates to keep the memory cool. Although RIMMs have a much faster clock speed than DIMMs, their real-world memory performance is only slightly better in most cases, and with the traditionally much higher price of RDRAM memory compared with DDR SDRAM, systems using RIMMs aren't all that popular. (See RAM stats on page 55 for details.)

Understanding dual-channel memory

Dual-channel memory designs are now widespread, thanks to chipsets from nVidia (nForce series), Intel (865 and 875 series), VIA (PT880), and the memory controller built into the AMD Athlon 64 FX and Opteron processors. Dual-channel doesn't refer to a different type of module, but to how memory is accessed.

Although systems with dual-channel chipsets can use just one DDR DIMM, their performance is slower than if you use two identical DIMMs and enable dual-channel mode. Why are dual-channel designs faster? As discussed earlier, the process of accessing a particular row of memory takes several clock cycles from start to finish. A dual-channel design can access each channel as soon as it is ready to provide the memory location desired, which reduces delays.

Although some vendors sell matched modules that have been tested as a unit, you don't need to buy a pair of modules to upgrade an existing dual-channel system that has just one module. You can buy another module with the same size and memory timing parameters (preferably the same brand/model) as your current module. If you don't know the brand and model of the memory in your PC, use a utility such as *SiSoft Sandra* (**www.sisoftware.co.uk**) to determine the brand and model of memory installed. You can also switch your memory setting in your system BIOS from "by SPD" to "User-defined" to see what your current module uses for its default settings.

If your PC supports dual-channel memory and uses RIMMs, check the memory socket type to learn whether you need to add two modules at a time. A RIMM with 184 pins supports one channel onboard, so an identical pair is needed for dual-channel support. 242-pin RIMMs contain two channels in a single module, so one module does the trick for dual-channel implementations, and two modules can provide four channels for high-end chipsets such as the new SiS R659. ➔

RAM Decoder

Here's how to understand common abbreviations and terms you'll see in memory ads and spec sheets:

2-3-3-7-1T: CAS Latency, RAS to CAS Delay, RAS Precharge, Active to Precharge, Command Rate.

16x64: The first number (16) is the size of each memory chip on the module (16Mbit). The second number (64) is the width of the module in bits. Multiply the size of chip by the width of the module to get the size of the module in Mbits. Then divide by 8 to convert Mbits to MB. A 64-bit wide module has no parity or ECC bits, so it does no error checking or correcting.

32x72: This represents a 256MB module (32x8) with extra bits for error correction. This module supports ECC, but the additional bits are ignored if the chipset doesn't support ECC, or if ECC is disabled in the BIOS setup program.

Single-banked: RAM modules that have just one bank.

TSOP: Thin small outline package refers to the packaging used in most RAM modules today.

CSP: Chip scale package refers to packaging that uses a ball grid array instead of pins to connect the chip to the board.

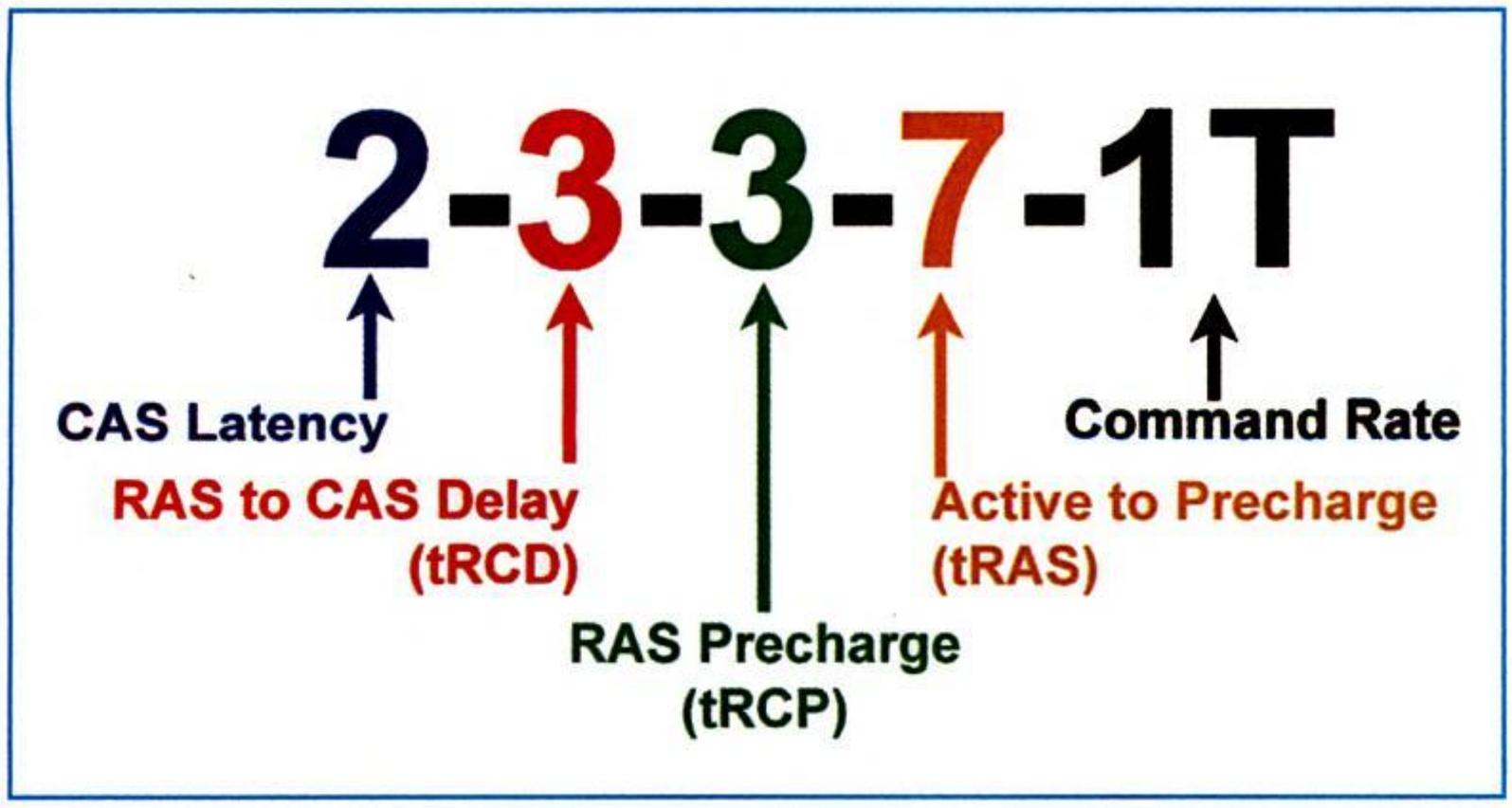

Figure 3: It's definitely the least sexy spec to look at, but these numbers (often found on the packaging or RAM module itself) express exactly what your memory is capable of. Check out our table on page 52 to find out how each value affects your memory speed.

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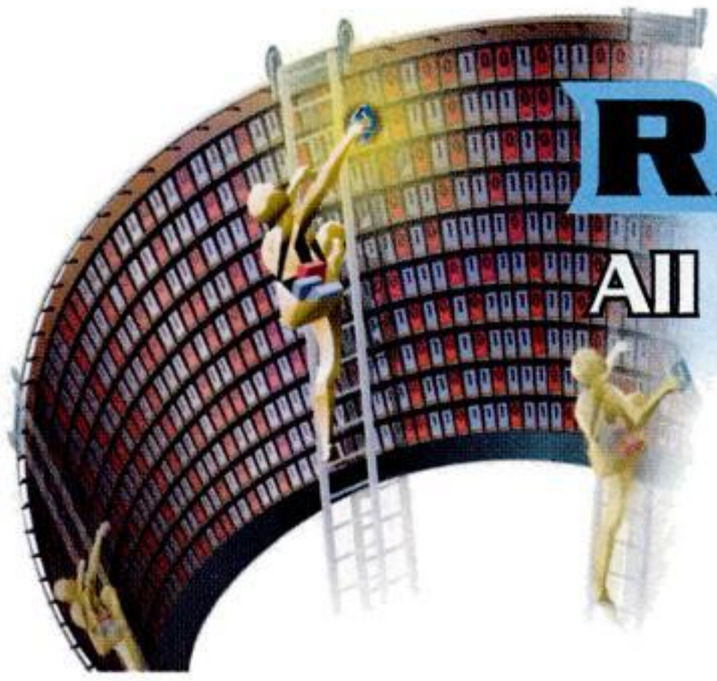

RAM: All Questions Answered!

Beyond PC3200—memory that works for overclocking

The JEDEC Solid State Technology Association (**www.jedec.org**) is the organization responsible for establishing memory standards. The fastest DDR SDRAM memory approved by JEDEC is DDR400, which is the memory used in PC3200 memory modules. However, many vendors, including Corsair Memory, Kingston, Mushkin, OCZ, and GelL now offer PC3700 and PC4000 modules. These modules are designed and priced for the overclocker/gamer market. Most of them feature heat spreaders and other extras designed to handle the higher heat and voltages used in overclocking. If you're content to run your memory at stock clock speeds and timings, stay with standard modules and spend your money elsewhere. But if the highest clock speeds on the planet are what you're aiming for, PC3700 and PC4000 memory should be on your shopping list.

As memory speeds increase, standard timing settings become more relaxed. For example, instead of the 2-3-2-6 timings typically used with PC3200 memory, PC3700 and PC4000 memory often use timings of 3-4-4-8.

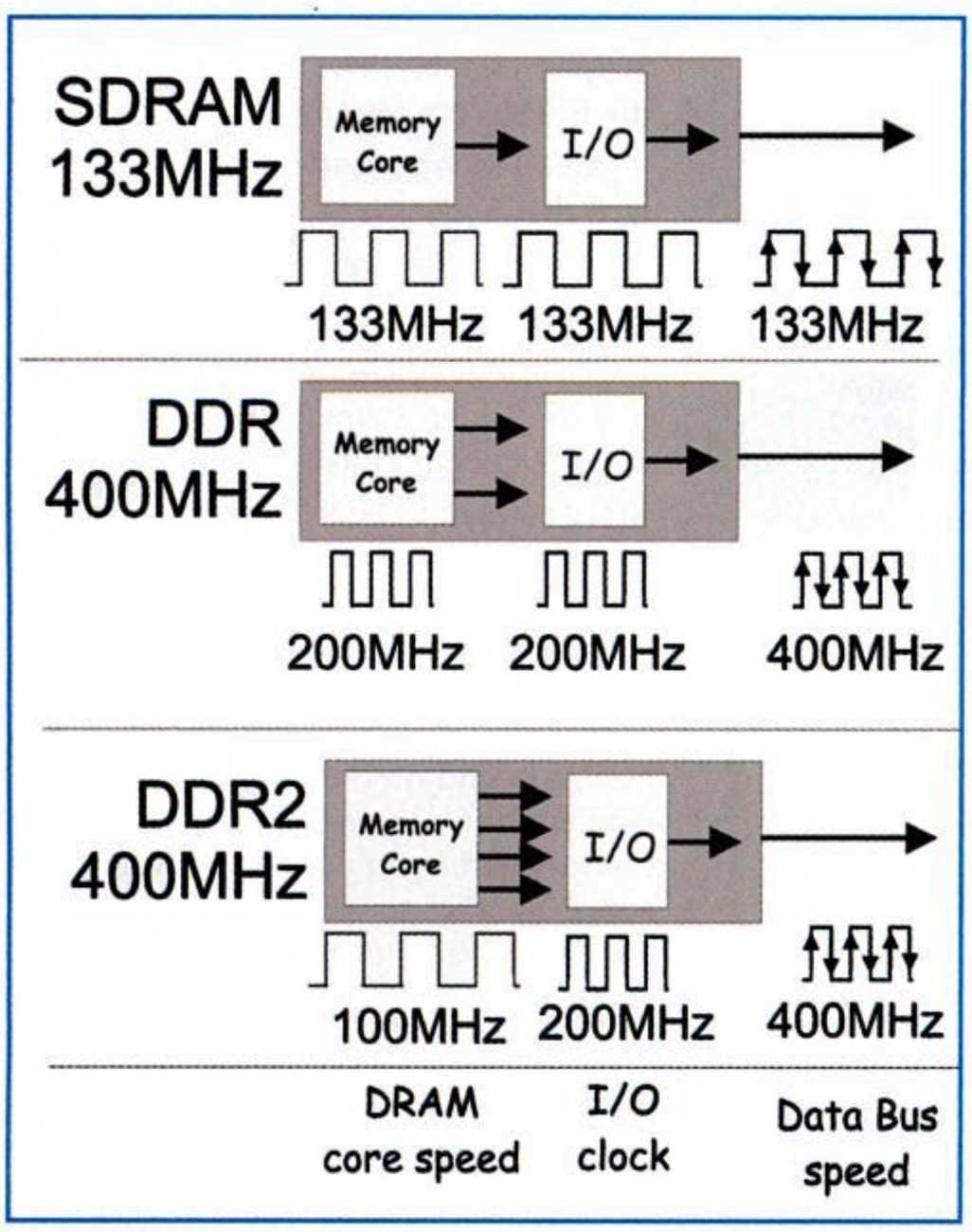

Figure 4: This chart illustrates how clock speed and simultaneous memory operations per clock cycle affect performance. Each rise and fall of the alternating line represents a single clock cycle, and the arrows emerging from the memory core represent how many operations can be performed within each clock cycle. More operations per second translates into faster performance, while faster clock cycles allows the memory to do more in less time.

Registered memory and the Athlon 64 FX

To provide maximum reliability, servers and workstations typically use registered DIMMs instead of the unbuffered DIMMs used in desktop computers. A registered DIMM uses an additional chip mounted horizontally on the DIMM to boost memory signals running to and from the module. This process takes one clock cycle, so registered memory is slightly slower than normal unbuffered memory. Registered memory is also more expensive than unbuffered memory, cannot be mixed with unbuffered memory, and must be supported by the motherboard chipset.

Because servers (which typically use special processors such as the Intel Xeon or AMD Opteron) use registered memory, we were surprised to learn that the first motherboards for the AMD Athlon 64 FX also require registered memory. Here's why: The initial versions of the Athlon 64 FX are based on the Opteron server/workstation chip. It's likely that future versions of the Athlon 64 FX will not require registered memory.

DDR2: The next wave

Starting late this year or in early 2005,

RAM FAQ

Got questions? We got answers.

What is registered memory?
Registered memory redrives memory signals for better reliability; it can't be mixed with standard memory.

What is ECC? Memory that uses additional bits for error correction; ECC support in the chipset is required.

What is access time?
That's the amount of time from when a memory module receives a request for data to the time that data becomes available.

What is non-parity?
Memory without error-checking or error correction. Same as non-ECC.

Whatever happened to quad-band memory?
The release of Kentron's quad-band memory (QBM), which is designed to provide DDR2 levels of performance in existing memory sockets by using a switching chip plus two banks of DDR memory, is running very late. Promised for the second half of 2003, it is not supported by any current chipsets; VIA's PT880 was supposed to support it, but doesn't. The latest news on Kenton's own QBM News web site (**www.quadbandmemory.com/news/news.htm**) is dated May 2003, so our prognosis for this DDR2 alternative isn't promising.

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Figure 5: DDR2 memory, like the one shown above, can scale up to 800MHz while running the memory core at just one quarter of that speed, a more efficient design that cuts its power requirements in half compared with DDR.

you will be able to buy systems that use the next generation of DDR memory, DDR2. DDR2, previously known as DDR-II, is designed to solve the shortcomings of current DDR memory:

➤ **Power:** DDR2 uses less than half the power of DDR memory to help reduce heat buildup and demands on laptop battery power.

➤ **High clock speeds:** DDR2 starts at 400MHz effective clock speed and can scale to 800MHz while running the chip core at just a quarter of the effective clock speed.

➤ **Component density:** DDR2 supports up to 2Gb chips, enabling a 2GB module to be supplied as a single-sided module.

➤ **Chip size:** DDR2 memory chips are half the size of those used by DDR modules.

➤ **Chip connection technology:** DDR2 memory chips use a ball grid array (BGA) connector.

Figure 4 (page 54) compares the speeds used in a PC133 (133MHz) SDRAM module, a current DDR PC3200 (400MHz) module, and a DDR2 400MHz module. Note that both the DDR and DDR2 modules have the same effective clock speed, but the DDR2 module does it with memory at a slower core rate than the old PC133 module!

Externally, a DDR2 module (Figure 5) resembles a DDR DIMM. However, note the smaller size of the memory chips and the 240-pin connector. SO-DIMMs for notebooks use a 200-pin connector, and mini-DIMMs made for specialized uses such as printers and routers use a 244-pin connector. ■

How We Test RAM

Your basic run-of-the-mill RAM test program writes various test patterns into memory and reads them back again; if the patterns don't match, you have bad memory. The process can take anywhere from a few minutes to several hours.

The best way to test memory, however, is with a hardware tester. We like the R.S.T Pro2 (RAM Stress Test) card made by Ultra-X (www.uxd.com). It plugs into a PCI slot, tests virtually every type of memory while installed in the computer, and works with the latest processors and chipsets.

We used it for our "Memory Meltdown Challenge" in the November 2003 issue.

Hardware testers cost serious bucks. Fortunately, there are several free testing programs available which can help you detect some problems with memory. Our favorite is *Memtest 86*, available from www.memtest86.com. You can also download *Doc Memory* from www.simmtester.com. Both programs are available on this month's Maximum CD. Other memory test programs are included in diagnostic programs.

RAM STATS

RAM TECHNOLOGY	TYPES	CLOCK SPEED	FORM FACTOR	MAXIMUM THROUGHPUT	NOTES
SDRAM DIMM	PC66	66MHz	168-pin	533MB/sec	One access per clock cycle
	PC100	100MHz		800MB/sec	
	PC133	133MHz		1.066GB/sec	
DDR SDRAM DIMM	PC2100	100MHz	184-pin	2.1GB/sec	Two accesses per clock cycle
	PC2700	133MHz		2.7GB/sec	
	PC3200	166MHz		3.2GB/sec	
	PC3700	200MHz		3.7GB/sec	
	PC4000	250MHz		4.0GB/sec	
RDRAM RIMM	RIMM1600	400MHz	184-pin	1.6GB/sec	16-bit (single channel)
	RIMM2100	533MHz		2.1GB/sec	
	RIMM2400	600MHz		2.4GB/sec	
	RIMM3200	400MHz	242-pin	3.2GB/sec	32-bit (dual-channel)
	RIMM4200	533MHz		4.2GB/sec	
	RIMM4800	600MHz		4.8GB/sec	

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Ask the Doctor

Symptom ▶ Diagnosis ▶ Cure

CAN'T GET MY GAMES OFF THE GROUND

I just built a PC using an Asus P4C800 mobo, 512MB of RAM, a Western Digital 80GB hard drive, an ATI Radeon 9600, and Windows XP. Whenever I start to play a game, I get about two minutes into the game and it kicks me out to my desktop. I start the game again, and it happens again! Do you have any idea what's wrong?

—SAUL

Sometimes the Doctor feels like he's repeating himself. This kind of "games work for a while, then they crash/my machine reboots/the elves in my computer go on strike" problem is the most common complaint the doctor receives. Almost all these crashes, like the one Steve describes, are caused by one of three things: a heat issue inside the case, a power supply that doesn't provide enough juice, or a user who hasn't installed his motherboard's chipset drivers.

The 9200 isn't as power intensive as some cards, and power supply issues usually result in the machine actually restarting rather than just crashing an application, so we'll scratch the power supply off the list. If you've installed the latest chipset drivers from Shuttle's web site, we can safely assume that your machine is overheating.

To verify a possible overheating issue, run the machine sans case door while playing a game. If your game plays OK without the case door on, you need to improve your case's airflow. Make sure you are sucking air into the case at the bottom and blowing it out the top, and that there are no stagnant areas around your videocard, CPU, and RAM.

If that doesn't work, try removing the CPU heatsink and fan, and then use rubbing alcohol and a paper towel to clean off any residual thermal compound from both the CPU and the heatsink. Finally, reapply new thermal compound and reattach the CPU heatsink. If that doesn't work, you should try upgrading to a bigger CPU heatsink and adding another fan at the top or rear of the case to help move more air.

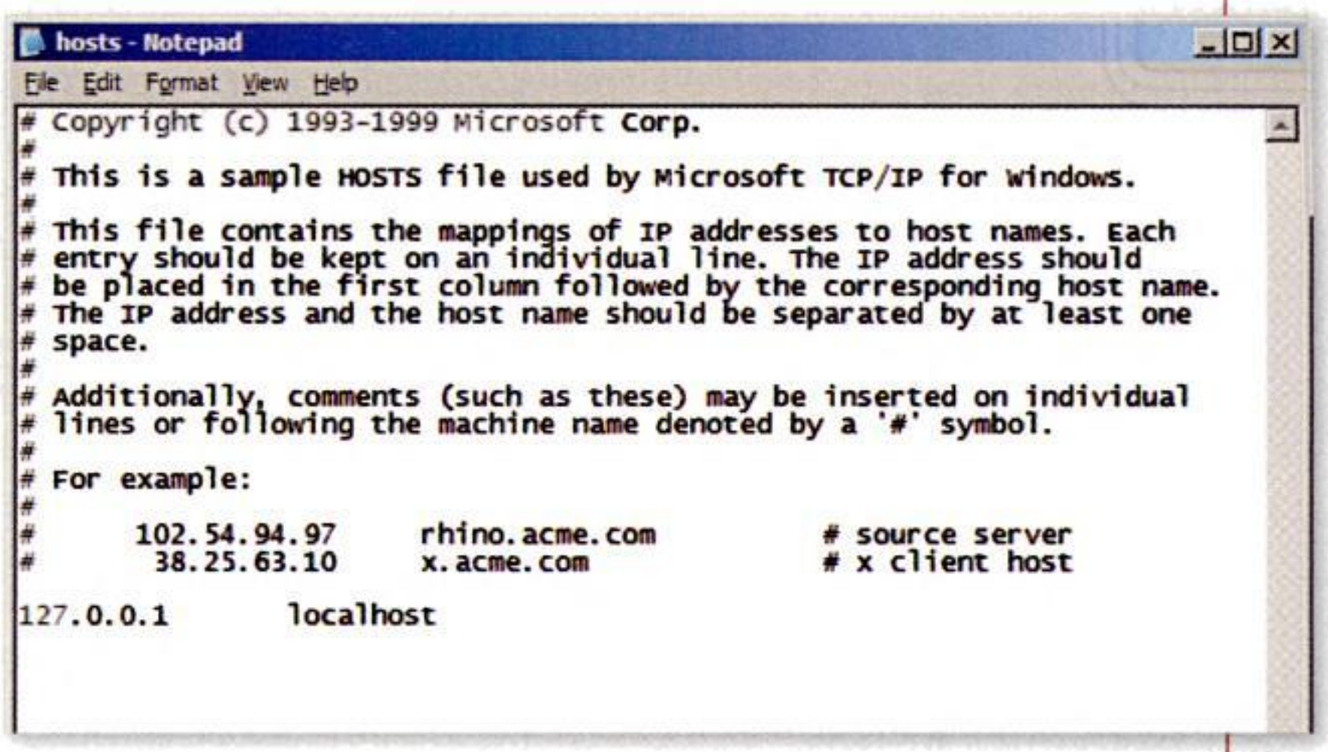
HOSTS HOSED ME

My rig was working fine, but lately I've had a problem with *Internet Explorer*. I open it, but can't access any web sites. I look at the status bar to make sure it's trying to load a page, but instead it says "Connecting to site 127.0.0.1" and never loads anything. Am I going to have to wipe my rig and start from scratch to fix this problem?

—SGT. JAMES HOLLIDAY

The type of problem you're describing is usually caused by either a network failure or a misconfiguration of a special file called the "hosts" file, or occasionally the "lmhosts" file. The hosts file can be used for basic network configuration, but most users have a single entry in it configuring their machines to use the local host IP address of 127.0.0.1.

The Doctor's best guess is that you've inadvertently misconfigured your hosts file. Because typing any URL into your browser directs you to 127.0.0.1, we bet your hosts file is making your PC think that every URL on the Internet is 127.0.0.1. In *Notepad*, open the hosts file (it's usually in C:/Windows someplace, but you may have to search for it) and remove all the entries except for the "127.0.0.1 localhost" entry. Do the same thing for the lmhosts file, if your machine has one, and then reboot your PC. That should fix it.


hosts - Notepad
File Edit Format View Help
Copyright (c) 1993-1999 Microsoft Corp.
#
This is a sample HOSTS file used by Microsoft TCP/IP for Windows.
#
This file contains the mappings of IP addresses to host names. Each
entry should be kept on an individual line. The IP address should
be placed in the first column followed by the corresponding host name.
The IP address and the host name should be separated by at least one
space.
#
Additionally, comments (such as these) may be inserted on individual
lines or following the machine name denoted by a '#' symbol.
#
For example:
#
102.54.94.97   rhino.acme.com   # source server
38.25.63.10   x.acme.com   # x client host
127.0.0.1   localhost

The hosts file overrides any other domain name information, regardless of its source. If you've misconfigured the file, you'll have a hard time connecting to the net.

LEGACY APP WOES

I have used a database program for years, but it won't work with Windows XP. It originally was a DOS program, and there is an updated version that works with Windows 98. I have tried to use the emulator in XP, but the app just won't run. How can I get a Windows 98-compatible program to work with Windows XP?

—RICHARD FERN

Like Kenny Rogers sings, you gotta know when to hold 'em, and know when to fold 'em…. The Doctor knows it's difficult to bid adieu to an application that's served you well for years, but Richard, it's time.

The sad fact is, some applications work with the Windows XP compatibility tools, and some don't. We recommend you find a way to export your data from your old database app into a more commonly recognized format. Almost every application lets you import from comma- or tab-separated text files, so you should dump your old database into a .CSV (comma separated value) file from a Windows 98 machine, then import it into your new database app.

MY TOWER THINKS IT'S A DESKTOP

I built a mid-tower PC with an A7N8X Deluxe, 1GB of DDR PC2700, and an Athlon 2500+ Barton. I'm cooling the Athlon with a Xaser Volcano fan. It worked like a champ for several weeks, then I left it running while I was away one afternoon and returned to find it with a blank screen and an audio message saying, "System failed CPU test." Power on/off produced the same results: no display on screen and the repeated audio warning.

Following the instructions I read on a support site, I set the case on its side and tried

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again. To my shock, it booted fine. I checked that the CPU fan and memory were snug, and they appeared to be. What else should I check? If this is a weight/mounting problem, what can I do about it?

—TERRY GOWETT

There are a couple things you should try. You may want to reseat the CPU in the socket and make sure you are using the correct shim for your CPU. Also, arm yourself with a good flashlight and make sure you have every single CPU jumper set correctly on the motherboard. You should also check all the power connections from your power supply to your mobo. Finally, make sure you have the latest BIOS for the board, and make sure you have a good-quality power supply.

APPARENTLY, I'M NOT SO SMART

Every time I boot, my Pentium 533 displays two messages: "SMART is bad... back up and replace." and "Drive is SMART capable but disabled." What do these messages mean, and what is SMART anyway? I've read my owner's manual and can't find any reference to it.

—KENT MCLEOD

S.M.A.R.T. stands for self-monitoring, analysis, and reporting technology. Basically, S.M.A.R.T. monitors the health of your hard drive and should give you an early warning if your drive is on the brink of failure. The messages you are receiving suggest that one of your drives is failing and the other is not being monitored by S.M.A.R.T. You can turn S.M.A.R.T. on and off in your system's BIOS. The Doctor also recommends that you back up any important data from the drive that S.M.A.R.T. reports as failing.

LAPTOP HARD DRIVE OPTIONS

My Gateway m500 laptop has served me well for a long time, but the 40GB hard drive that came factory installed is a turtle! It's a 4200rpm Toshiba TravelStar and is very sluggish at booting, loading Windows, and loading anything else. I was told by Gateway customer support that this laptop supports up to a 40GB hard drive, but they wouldn't recommend a faster drive to me. I'd hate to settle for a 5400rpm drive when the 7200rpm drives offer way more bang for the buck! Do you have any recommendations?

—BILL JOHNSON

Pretty much any mobile hard drive will work with any laptop, assuming it will fit into the drive bay. To tell how much room your drive bay has, remove the drive that's currently in your machine, measure it, and then eyeball the drive bay to see if there's any extra room for a larger drive.

Before you remove your laptop's hard drive, you should disconnect the power supply and remove all the batteries from your laptop. Then follow the directions in your manual for removing the hard drive. Every notebook is different; in some, the drive is easily accessible, but others force you to disassemble practically the entire machine.

If it will fit in your laptop, we recommend the Hitachi Travelstar 7200rpm. It comes in a wide variety of capacities, and is smokin' fast.

HOW DO I REWARD OPEN SOURCE DEVELOPERS?

I'm now a die hard fan and user of certain "open source" apps. I regularly use *Mozilla Firebird*, *Open Office*, *Mailwasher*, and loads of other handy, free apps. The problem is that I feel guilty using programs that are better and easier to use than their costly alternatives.

What is the best way to fairly compensate the programmers without worrying that my credit card number will be hijacked in the process? Should I even feel compelled to pay developers who openly make their goods available for free?

—DAVE TURMAN

The Doctor uses a lot of free software too. Many developers ask for small donations, or micropayments. Check the site's home page for details. The Doc uses a Paypal or Amazon account to help those developers out.

Many other programmers contribute to larger projects, such as *Mozilla Firebird*, for the pride of contributing to the greater good, and don't expect any kind of monetary reward. If you'd like to help support larger open source projects, most run nonprofit organizations that support new development. Find out about the Mozilla Foundation at www.mozilla.org/foundation. ■

IS MY HEADPHONE JACK VESTIGIAL?

I can never seem to get the headphone jacks to work on my CD/DVD-ROM drives. Does something have to be enabled to get them to work? Is there a cable that I need to split to run to the audio on the back of my computer and then back to the CD-ROM drive? Why would they put a jack on the front of my drive if it doesn't do anything? Are they just screwing with my mind?

—JOSH RIBBLE

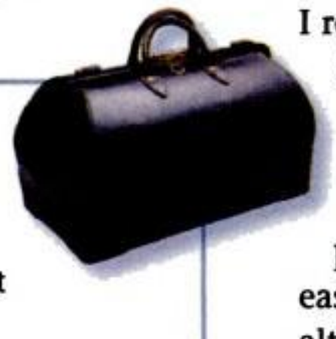
The headphone jack only works if your optical drive is configured to use the analog output for audio. It won't work if you're digitally extracting audio to listen to CDs.

The headphone jack is a vestigial organ from the Windows 3.1 days, when most people weren't blessed with soundcards. But optical drives did have inexpensive, built-in digital-to-analog converters that could take the digital signal from a CD, convert it to an analog signal, and send the output to your headphone jack. Suddenly, you had an instant CD player. Very cool.

But as you've noticed, the headphone jack doesn't do much these days. In fact, you won't even get any sound from it with most system configurations. That's because your soundcard and operating system have teamed up to create a digital, as opposed to analog, path from your audio CD all the way to your speakers. If you want to listen with headphones, use the line-out jack on your soundcard. If you don't have a breakout box that brings the line-out to an accessible spot, you can buy a headphone extension cord from Radio Shack for peanuts instead.

If you're determined to use your optical drive's headphone jack, it's still possible—you just have to get your analog signal back. In XP, right-click My Computer, select Properties, and click Device Manager. On the device list, click the + sign next to DVD/CD-ROM drives, and right-click the drive you want to plug your headphones into. Select Properties from the menu, then click the Properties tab. Uncheck "Enable digital CD audio for this CD-ROM device." Your headphone jack should now work.

If you want to be able to play the audio through your PC speakers and headphones interchangeably without having to dig up this checkbox, you'll need to connect the analog-out from your optical drive to the analog-in on your soundcard using a special two-pin cable that should have come with your drive. Check your drive's documentation to find the analog-out on the back of the device.



There comes a time in every young doctor's life when he must choose. Choose to fight for good or evil. Choose to help people or PCs. This doctor chooses PCs. Whether your PC isn't working, smells funny, or just ain't right, the Doctor can help. E-mail your PC problems to **doctor@maximumpc.com**, but don't expect him to respond to every e-mail.

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How To...

A step-by-step guide to tweaking your PC Experience

Remotely ACCESS YOUR PC

MAXIMUM PC
TIME TO COMPLETION
1:04
HOURS MINUTES

Windows XP Professional includes a basic PC remote control tool, which lets you log into your PC remotely from anywhere. Do you know how to use it?

BY WILL SMITH

It's called Remote Desktop Connection, and when you've properly configured your PC, this handy utility will let you log into your computer from anywhere in the world and control it as if you were sitting in front of it instead of half a world away.

If you're running Windows XP Professional, you already have all the software you need to connect remotely to your PC. Whether you'd like to monitor a server, grab files from your home PC at work, or just keep an eye on your machines when you're out, connecting remotely is easy to do. However, due to the vagaries of network configurations and various other quirks beyond your control, you may not be able to actually connect. That's where we come in.

PREPPING YOUR SYSTEM

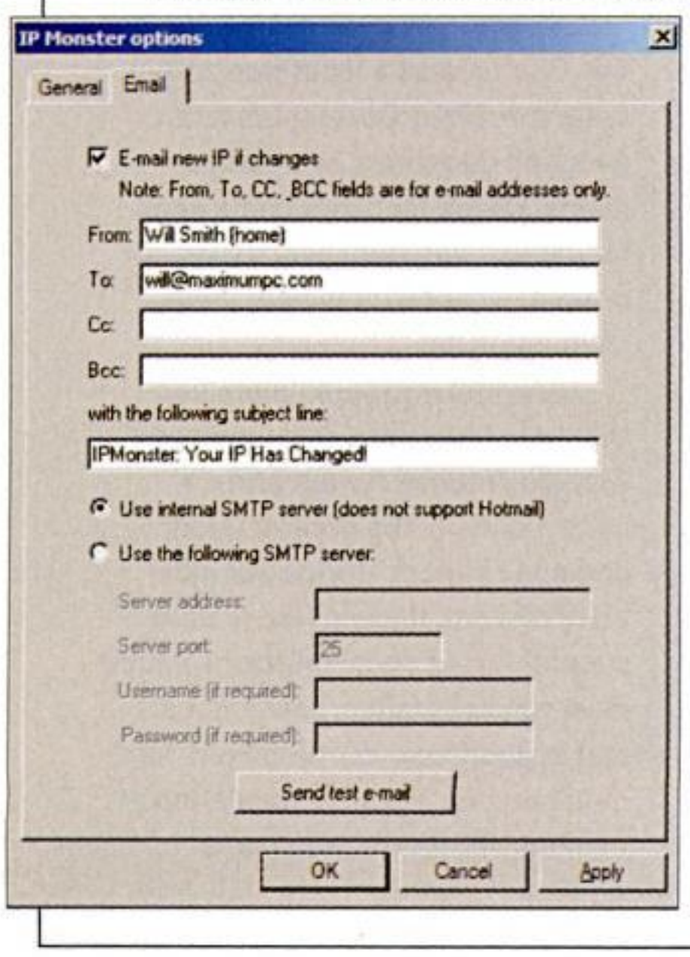
First, you need to know the IP address of the computer you want to connect to. The only sure-fire way to always be able to connect to your PC is to use an ISP that provides you with a static IP address. Most ISPs give customers dynamic IP addresses, which can change every few days or even hours. Because your IP address is the way you'll locate your computer on the net, you'll need to know what your IP address is and monitor it as it changes.

The good news is that there are loads of programs that will notify you of IP address changes, whenever they occur. We like *IP Address Monster* (**www.ipmonster.com**). It's a small program that runs in your system tray and can be configured to e-mail you whenever your IP address changes.

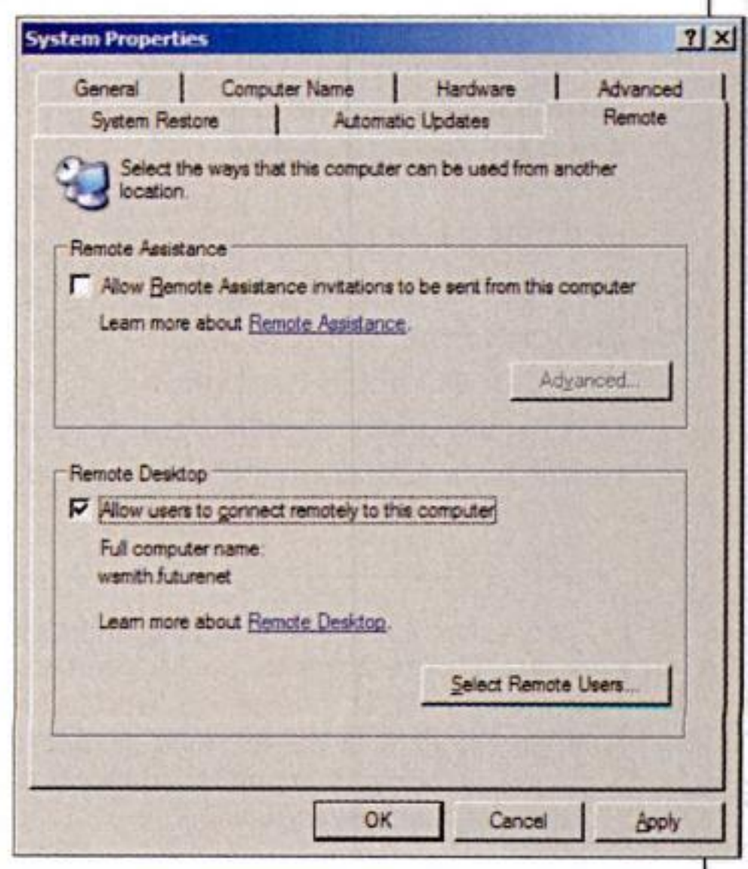
Now that you know your IP address, you need to make sure that Remote Desktop Connection is enabled. Make sure your firewall is configured to allow incoming connections on port 3389 (firewalls vary, so check your documentation to find out how to open the port).

You can turn on Remote Desktop Connection in the System Control Panel (Start, Control Panel, System). Check the Remote tab and make sure "Allow users to connect remotely to this computer" is checked. You'll also need to have at least one user account set up with a password because accounts without passwords are prohibited from logging into Remote Desktop.

It's important to have a "good" password on the machine you're going to remotely log into. This means you should use a mixture of letters and numbers and avoid words that are found in dictionaries. You should also change the password regularly to protect yourself from mischief.



***IP Address Monster* should be your first stop to remote connectivity. This handy utility will keep tabs on your Internet address and send you an e-mail whenever it changes.**



To enable Remote Desktop, open the System Control Panel, go to the Remote tab, and check this box.

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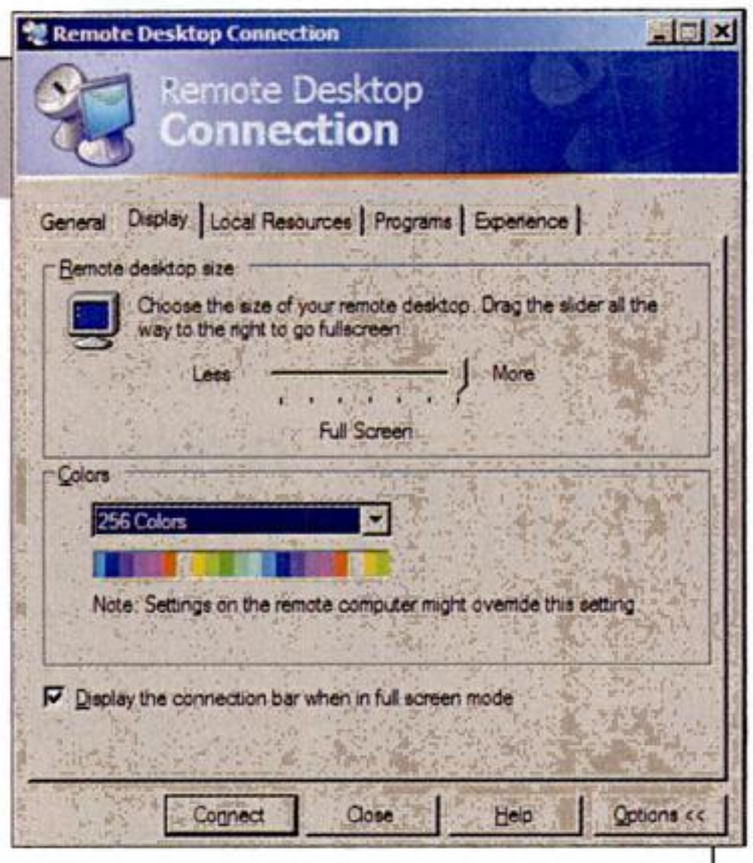
MAKING THE CONNECTION

At this point, your PC should be prepped and patiently waiting for a connection. To log in, you need to open the Remote Desktop Connection client on your remote PC. Go to Start, Programs, Accessories, Communications, Remote Desktop Connection. Input the IP address you want to connect to (courtesy of *IP Address Monster*) in the Computer field. Then enter your username and password.

Now you'll want to tweak a few settings to optimize your remote experience. Whiz-bang features gobble up bandwidth, so you should tune your settings to match your home net connection. We recommend you start with a minimal feature set. Press the Options button, then the Display tab. Change the display settings to full-screen, 256-color. This looks acceptable and consumes practically no bandwidth. You'll also want to browse to the Experience tab and change the Performance setting to accurately reflect your home PC's connection speed.

Switching to a lower color resolution and a smaller display area will greatly minimize the amount of data that has to transfer between your computer and the remote PC.

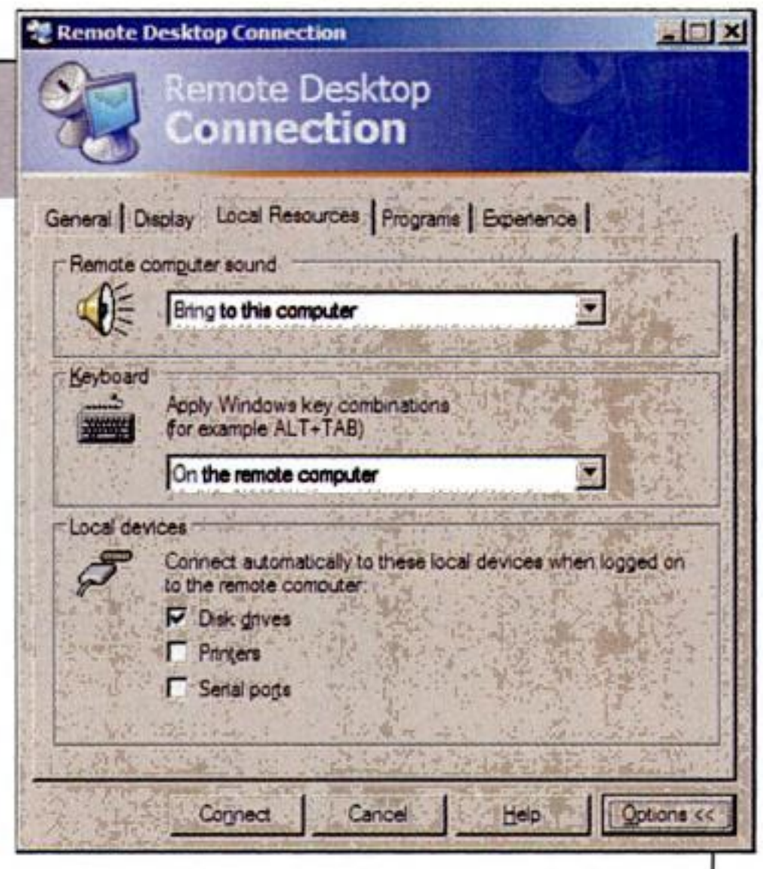


Once you've tuned the connection a bit, you're ready to connect. Press the Connect key and you're in!

WHAT TO DO NEXT

At this point, you should be connected. You can run programs and manipulate files just like you're sitting in front of your PC. In fact, you can even use your PC's e-mail and web browsers. Do you want to start downloading *Desert Combat* now so you can start playing it when you get home? That's easy enough; just log into your PC using Remote Desktop, open your web browser, and download the file. It will be sitting on your machine waiting for you as soon as you get home. If all your PCs are running Windows XP Pro, and you enable drive-sharing in the Local Resources tab, you can transfer files from remote PC to local PC. You can even remotely transfer files between local PCs on your home network. ■

Once connected, you can interact with printer ports and networked hard drives. This is a handy way to delete those "special interest" videos you downloaded before your wife finds them.



HOW-TO SHOP ONLINE, THE SAFE WAY

Buying online is easy and convenient, but it can be risky. Follow these guidelines to avoid a consumer disaster!

1. Visit **www.bbb.com** and search the Better Business Bureau's files for complaints about the online retailer you're considering. Then check **ResellerRatings.com**, a site where consumers rate online stores. A good record is generally enough to tell you that a store is reliable. Keep in mind that every store will have a few registered complaints, so don't let one or two negative comments spook you. In fact, stores with too many clean reviews raise our suspicions.

2. Read and print all of the store's policies. What's the return policy? What is the restocking policy? How long will the store warranty a product before you have to send it directly to the manufacturer? Is there a restocking fee for DOA equipment?

3. Keep detailed records. When you buy online or have conversations with customer service, write down whom you spoke to and when you spoke to them. And get a confirmation number from your contact! If the transactions are online, print out the confirmation information and keep it in a safe place.

4. Use a credit card with a good fraud protection policy. Do not wire payments, send cashier's checks, or personal checks. A credit card will protect you if the deal goes sideways. PayPal won't.

5. If the deal does go bad, immediately call your credit card company and reverse the transaction. Make sure you submit a reversal request in writing before the credit card company's deadline expires. Unscrupulous stores will deliberately delay responding to your inquiries until the deadline has passed.

—GORDON MAH UNG

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In the Lab

A behind-the-scenes look at Maximum PC testing

SYSmark 2004: More is Better

Our favorite benchmarking app continues to prefer fast CPUs, lots of RAM, and memory bandwidth. The big change: More detailed reporting

When BAPCo introduced the 2001 version of *SYSmark*, some benchmarkers were disappointed that the company eliminated a great deal of the detailed analysis that the program previously reported. While *SYSmark 98* used to tell you how long it took for, say, *Premiere* to run, *SYSmark 2001* threw away most of this data. That's because individual application performance could no longer be measured with the benchmarking suite's new model of concurrent use, or running multiple applications at once. Similarly spare, *SYSmark 2002* reported just three scores: Overall, Internet Content Creation, and Office Productivity. While the concurrent-use model worked fine, the lack of data resolution left testers guessing which program was performing poorly. Thankfully, with *SYSmark 2004*, BAPCo returns us to the good old days of detail.

Although you still can't tell specifically whether it was *Dreamweaver MX* or *Premiere* that hurt (or helped) performance, at least you can now narrow your guess down to two or three apps and the type of usage behind the scores. This allows us more insight for analysis when a PC system throws up poor numbers.

In addition to the Overall score, *SYSmark 2004* now reports 3D Creation, 2D Creation, and Web Publication as aspects of the Internet Content Creation score. *SYSmark 2004* also breaks down the Office Productivity score into three divisions: Communication, Document Creation, and Data Analysis. Our benchmark chart will continue to report the overall *SYSmark 2004* score, but we'll report details of the individual test runs when relevant.

Following are details of *SYSmark's* Internet Content Creation test:

➤ The **3D Creation** score indicates how fast the tested machine can render a 3D model in *3ds max 5.1* while preparing a web page with *Dreamweaver MX*.

➤ The **2D Creation** score is based on how long a system takes to use *Premiere 6.5* to create and export a movie. This test also uses *Photoshop 7.01* and Adobe's *After Effects 5.5*.

➤ The **Web Publication** score is derived by using *WinZip 8.1* to extract a compressed file while *Flash MX* is used to open an exported vector file. A movie is encoded with *Windows Media Encoder* 9 and scanned with *VirusScan 7.0*.

The Office Productivity test includes:

➤ A **Communication** score based on how well the system performs in *Outlook 2002* while *VirusScan 7.0* runs in the background. *Internet Explorer* is also used to view BAPCo's corporate web site and browse files created by *SYSmark*.

➤ The **Document Creation** section involves editing a file in *Word 2002* and using *Dragon NaturallySpeaking 6* to dictate a document. The document is then turned into a PDF using *Acrobat 5.0.5*. Finally, *PowerPoint* is used to create a presentation based on the document.

➤ The **Data Analysis** portion of the Office Productivity test queries a database in *Access 2002*. These results are imported into *Excel 2002* and used to generate a graphical chart.

Great, but what are the results?

We ran *SYSmark 2004* on our zero-point Athlon 64 FX equipped with an ATI Radeon 9800 XT card to generate a score that can be compared with other review systems. We also wanted to see the impact of memory bandwidth on our system, so we ran it in a single-channel configuration and with the memory cranked down to 200MHz instead of 400MHz.

The results surprised us. The Office Productivity section of *SYSmark 2004* proved to be extremely sensitive to memory bandwidth. This manifested itself in the single-channel run as well as when we ran the main memory at DDR200 rates instead of DDR400.

While the Office Productivity score affected bandwidth and hard disk I/O, the Internet Content Creation score is less sensitive to bandwidth, but scales nearly perfectly with clock speed. Decreasing by half the speed of a 3.2GHz P4 Prescott to 1.6GHz, for example, netted us a 50 percent drop in performance for the Internet Content Creation portion, while the Office Productivity dropped by just 39 percent.

CPU	2.2GHz Athlon 64 FX-51	2.2GHz Athlon 64 FX-51	2.2GHz Athlon 64 FX-51	1.6GHz Pentium 4E	3.2GHz Pentium 4E
SYSmark 2004	Dual Channel DDR400	Single Channel DDR400	Dual Channel DDR200	Dual Channel DDR400	Dual Channel DDR400
Overall	172	166	157	98	185
Internet Content Creation Overall	200	198	190	100	213
3D Creation	193	192	188	104	203
2D Creation	244	239	225	101	257
Web Publication	170	168	161	94	185
Office Productivity Overall	148	140	129	97	160
Communication	143	143	143	101	143
Document Creation	177	172	159	96	178
Data Analysis	127	112	94	94	161

***SYSmark 2004* reverses BAPCo's trend of providing less granular detail for each of its scores, with several new scoring subcategories.**

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Royal MD100 Media Destroyer

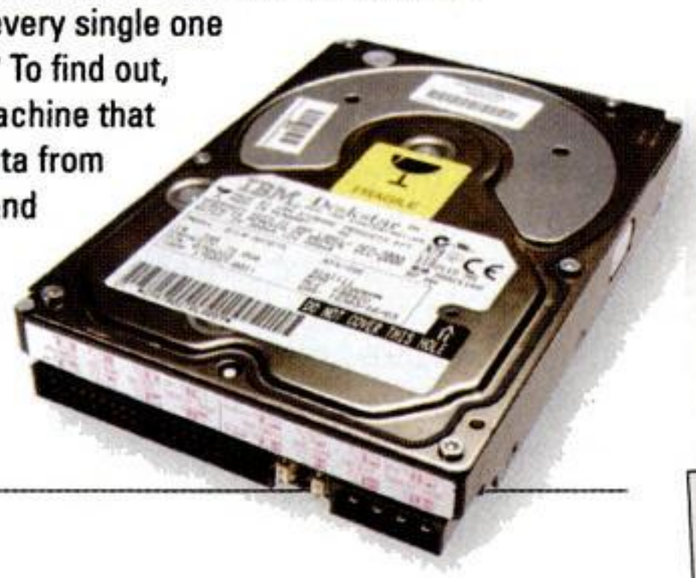
TESTED & GEEK APPROVED

If you toss old CDs and floppy discs into the garbage can, you may as well just post all the data they contain—account numbers, love letters, the shocking pictures that went with the love letters—on the web. Not even attacking the CD surface with a pair of scissors is an absolute guarantee, as we discovered this month when testing Arrowkey's data recovery software (page 75). The person with something to hide needs Royal's MD100 Media Destroyer ($100, **www.royal.com**). So far, we've watched about 85 CDs vanish into its slender, finger-proof maw, and the device shows no sign of blade fatigue. Even the metal inserts in the scores of floppy discs we fed the MD100 came out hopelessly mangled.

Feel free to get creative—the Media Destroyer will also happily shred credit cards, folded paper, grocery club cards, and potato chip bags. Yes, it's a little loud, but we're pretty sure that the approximately 1x.125-inch strips left behind after mastication either meet or exceed Department of Defense standards on data destruction, so we're OK with a bit of noise.

Lab Experiments: IBM's 75GXP Hard Drive

During a recent Lab cleanup, we unearthed a pair of pristine and nearly unused IBM 75GXP hard drives. While we've certainly had our share of failed "Deathstar" drives (five and counting), not every single one of these suckers can go bad. Or could they? To find out, we've wired up these two drives in a Lab machine that will operate 24/7 downloading torrents of data from the Internet. We'll run the drives until 2005 and report back on whether they survive or begin emitting the infamous "click, click, scratch, scratch of death."



Best of the Best

As of March, 2004

After several months of churn, our list of most favored hardware settles down at last. The only changes this month are the games we're playing.

High-end videocard:
ATI Radeon 9800 XT

Budget videocard:
BFG Asylum GeForce FX 5700 Ultra

Do-everything videocard:
All-in-Wonder Radeon 9800 Pro

Soundcard:
Sound Blaster Audigy 2 ZS Platinum

Serial ATA hard drive:
Western Digital 740GD/ IBM 7K250

Parallel ATA hard drive:
Western Digital WD2500JB

CD-RW drive:
Plextor PlexWriter Premium

DVD burner:
Plextor PX-708A

LCD monitor:
Sharp LL-1820

High-end CRT monitor:
Sony F520

Budget CRT monitor:
Cornerstone P1750

P4 motherboard:
Chaintech 9CJS Zenith

Athlon XP motherboard:
Asus A7N8X Deluxe Rev 2

Portable MP3 player:
Apple iPod 40GB

Photo printer:
Canon i900

Pocket PC PDA:
HP iPaq 5450

Palm OS PDA:
Palm Tungsten C

5.1 speakers:
Logitech Z-680

4.1 speakers:
Logitech Z-560

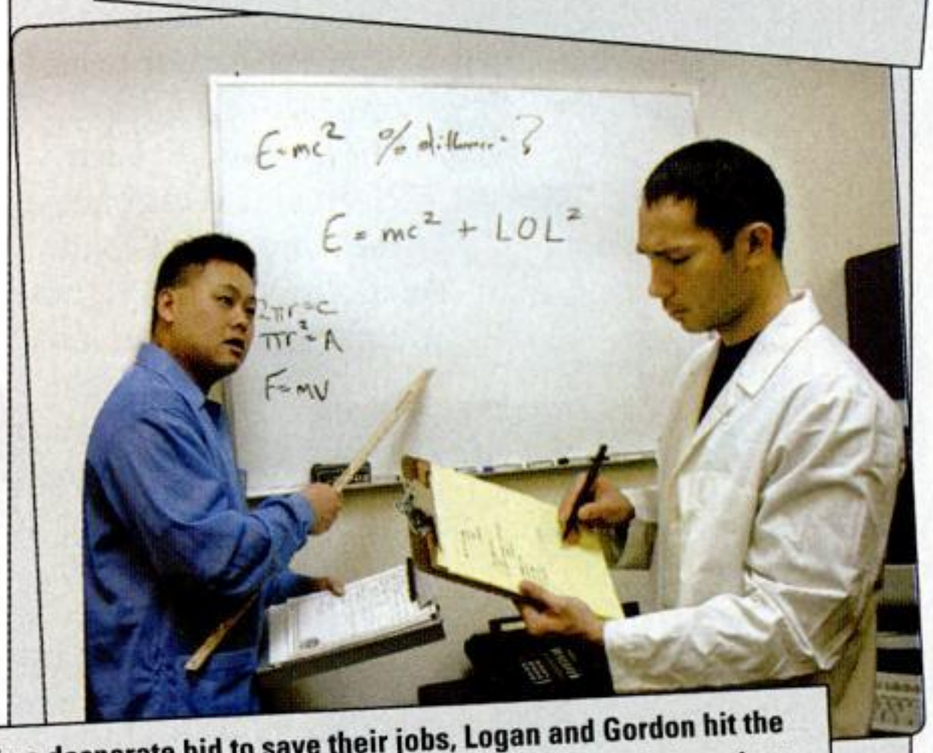
2.1 speakers:
Logitech Z-2200

Our current gaming favorites: *Prince of Persia: The Sands of Time, Dungeon Siege: Legends of Aranna, Star Wars: Knights of the Old Republic, Planetside*

EDITOR'S EDICT

Be More Funny!

New Editor in Chief George Jones lays down an edict when he reads the February issue: "You know what's funny about you guys? Not one damn thing. Be more funny by the end of the week or you're fired!"



In a desperate bid to save their jobs, Logan and Gordon hit the Lab. While testing the side effects of knock-knock jokes, they stumble upon the Decker-Ung Unifying Theory of Humor, which lets them mathematically determine the funniest things in the universe...

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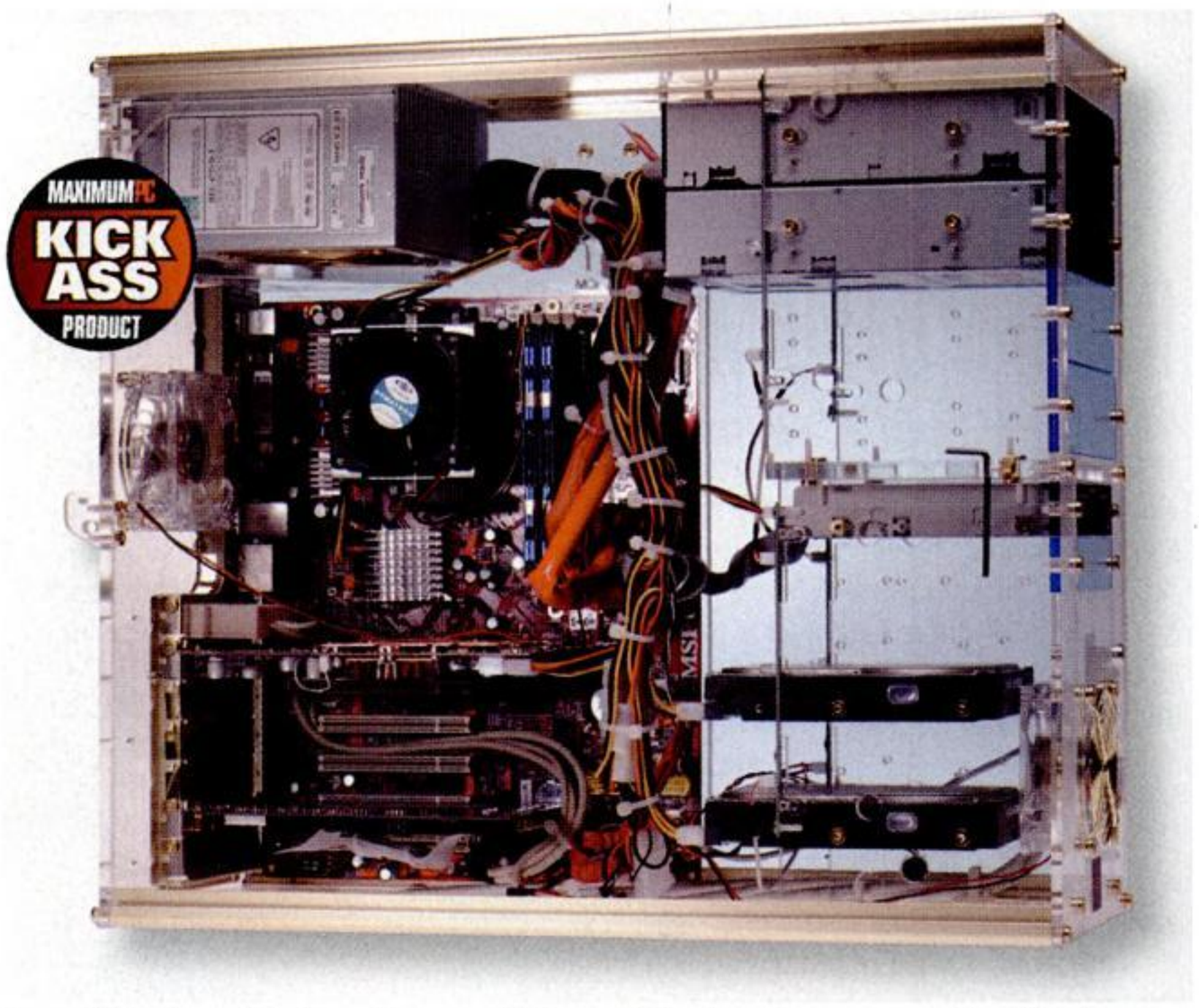
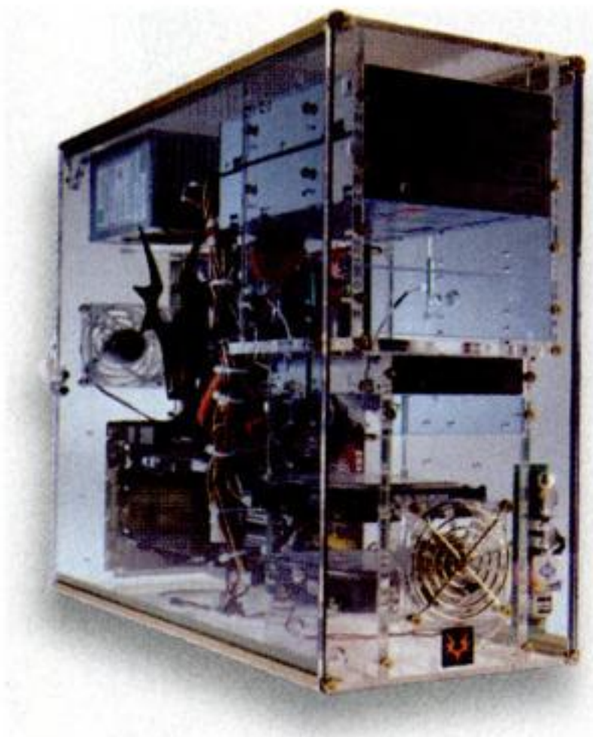
Vicious Assassin Special Edition

A gorgeous clear case combined with high-speed performance? Sign us up!



It's clear to anyone that Vicious has built a killer PC.



We hate to admit it, but we love clear cases. And why not? If you're going to spend two paychecks on red or blue PCB hardware and lights, why wrap it in aluminum or steel when you can go au natural and let it all hang out? But at the same time, we have to admit that clear cases can also be a horror. They're hard to keep clean and occasionally crack or otherwise fall apart. Thanks to Vicious PC, however, this final flaw may no longer be a factor.

The Assassin is not the first clear PC, but it's certainly the finest. Illuminated by an array of blue LEDs strategically placed around the case, and a pair of multicolored fans, this system is both elegant and eye-catching. Despite the inclusion of just two relatively quiet fans, their careful placement and the airy internal layout ensure superb ventilation. More importantly, thanks to the four metal rails, heavy-duty acrylic panels, and a remarkably rigid structural design, Vicious PC manages to produce a case that feels as solid as it is sexy.

Accessing the Assassin's innards is a breeze, thanks to the side panels that smoothly slide out to the rear upon the removal of a single thumbscrew. The only bothersome aspect of working within this PC is the use of hex screws. Nifty in appearance, it won't take you 10 minutes before you find yourself cursing because you can't find your Allen wrench. (Thankfully, Vicious PC includes one.)

If the beauty ran only skin deep, we would have considered this system a pleasant distraction and nothing more. But the Assassin also packs quite a hefty punch. At its heart is a MSI K86-Neo mobo hosting AMD's brand-new Athlon 64 3400+ CPU. This mobo, which uses the VIA K8T800 chipset, is an excellent performer, and when combined with the 2.2GHz CPU, is able to trounce systems built around the vaunted FX-51 in many tests (more on that later).

In the Lab, we found the Assassin to be a remarkable performer. Even though its 3400+ CPU lacks the FX-51's dual-channel memory controller, it's clocked at 2.2GHz, which is 10 percent faster than the Athlon 64 3200+. This combined with the VIA KT800 chipset makes for dynamite results. The system posts a *SYSmark 2004* score of 198, which smacks around our FX-51 reference system by a whopping 26 points. The 198 score puts it just behind the 3.4GHz Pentium 4 Extreme Edition system we used to test CPUs this month. (It must be said that, unlike the Assassin, neither our zero-point nor our P4 EE system had RAID 0 storage.)

The system's performance in *MusicMatch 8.1* and *Photoshop 7.01* represents the best we have seen in an AMD system to date. Lastly, while the graphics performance indicated by the *Halo* and *Jedi Academy* benchmarks broke no records, they are right up there with the fastest systems we have tested. Overall, the system finished notably ahead of our FX-51 baseline system in 5 out of 6 tests, and comes almost imperceptibly close in *Halo*. That's no small feat for a system that costs $3,000!

—DWIGHT LOOI

UNDER THE HOOD

THE BRAINS	
CPU	AMD Athlon 64 3400+ (2.2GHz)
Mobo	MSI K86-Neo (Socket-754, VIA K8T800 chipset)
RAM	1GB DDR400 Kingston Hyper-X (two 512MB modules)
I/O ports	Six USB (two front, four rear), one serial, one parallel, three IEEE 1394 (two on mobo, one on Audigy 2 ZS)
LAN	Fast Ethernet (integrated)
DISPLAY	
Videocard	ATi Radeon 9800 XT (412MHz core, 365MHz DDR)
STORAGE	
Hard drives	Two 36GB Western Digital Raptor (10,000rpm SATA), RAID 0
Optical	One NEC DVD+/-RW burner (ND-1300A, 4x DVD+/-RW, 16x CD-R, 10x CD-RW, 40x CD) One Toshiba 16x DVD-ROM
Other	One 1.44 MB Floppy drive
AUDIO	
Soundcard	Sound Blaster Audigy 2 ZS 7.1
FINE DETAILS	
Power supply	475-watt Herolchi HEC-475VD-T ATX-12V.
Fans/extras	Two 80mm clear case fans, OEM CPU fan.
Keyboard	Multimedia 9801
Mouse	Microsoft Intellimouse Explorer Optical
BUNDLE	
Windows XP Home	
BOOT: 45 sec.	**DOWN: 10 sec.**

Our zero-point system includes: a 2.2GHz Athlon 64 FX-51, an Asus SK8N motherboard, 1GB of Corsair Registered TwinX DDR400 RAM, an ATI Radeon 9800 XT, a 250GB Western Digital WD2500JB hard drive, Plextor PX-708A DVD burner and a PC Power and Cooling TurboCool 510 Deluxe power supply.

MAXIMUM PC VERDICT 9

HAMMURABI

Beautiful, fast, and fairly priced.

SADDAM

Annoying hex screws that won't stay tight, 4x DVD burner.

$3,000, www.viciouspc.com

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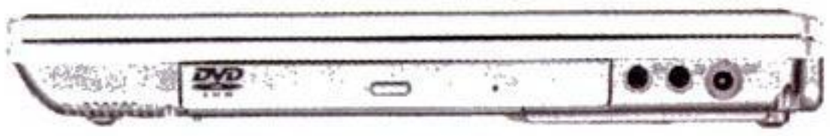
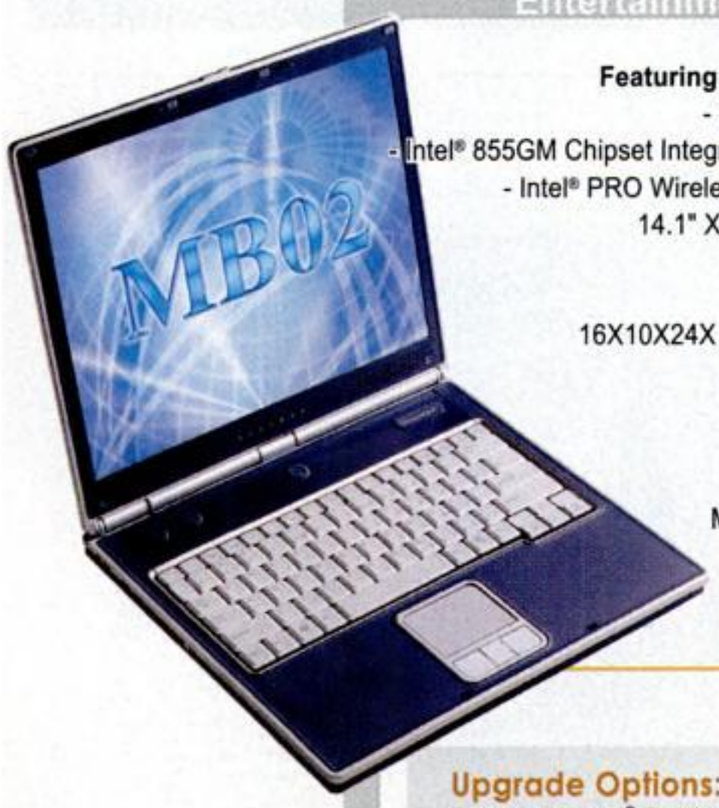


MOBILE TECHNOLOGY

SuperTalent™ DM-MB02-P

EntertainmentNOTEBOOK



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- Integrated V.92 56K Modem
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ExecutiveNOTEBOOK

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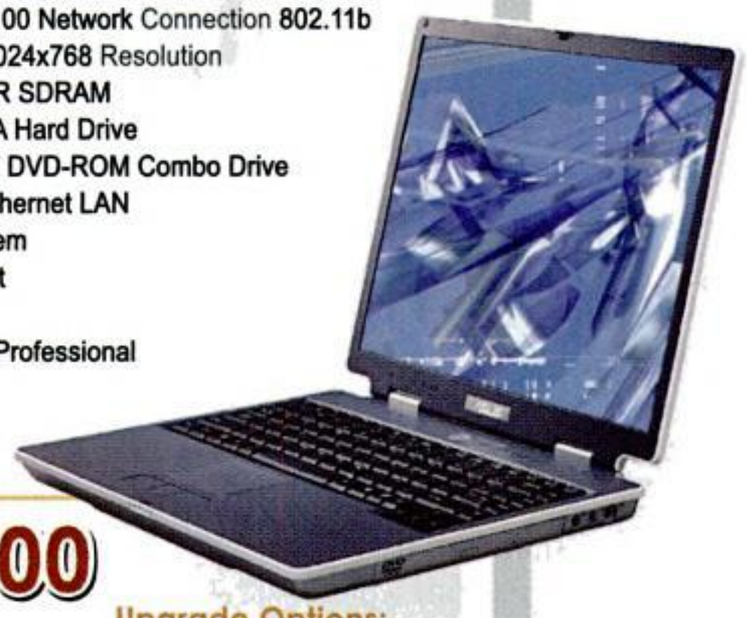

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Belkin Bluetooth GPS Receiver

MAXIMUM PC KICK ASS PRODUCT

Global positioning via PDA—with no strings attached

If Hansel and Gretel could have had Belkin's GPS Receiver, the world would have had one less fairy tale. Or would it?

Joan of Arc said she was guided by voices, and they executed her. We were guided by voices, too, but fared much better than she did. That's because our directions came from a Bluetooth-enabled iPaq 5455 connected to Belkin's Bluetooth GPS Receiver. The GPS device took note of our location and sent the coordinates wirelessly to our handheld. The software loaded onto our handheld showed us where we were, and voice prompts from the handheld's speaker directed us from our modest Bay Area hamlet to a remote address about an hour east of South Lake Tahoe. As far as GPS systems go, none of this is particularly astonishing. What's remarkable is how well the whole package works.

The kit is simple. The GPS receiver was recognized immediately by our Bluetooth-enabled laptop and Pocket PC, and configuration took just a few seconds. We next loaded up the *Belkin Navigation* software onto our PC, and were greeted by an application that allowed us to select by region which maps we wanted to download to our handheld (the software contains maps for the United States and Canada), as well as any other additional information such as points of interest, airport locations, and even scenic views.

The maps that appeared on our handheld were legible, and intelligently highlighted major streets for reference in addition to those streets relevant to our route. Directions are automatically updated if you veer off course or make a "pit stop." The built-in rechargeable battery within the GPS unit lasted a generous nine hours, but Belkin includes a cigarette-lighter adapter, an AC adapter, and a USB charger for longer hauls. All the data collected during a trip, including route, turnoffs, speed, and elevation, can be recorded to a file and played back later; in court, for example.

We think Joan would have enjoyed this gadget as much as we did, and the medieval price doesn't hurt either. So in a personal tribute to the woman who dared oppose the King of England, halfway through our trip we used *Belkin Navigation* to take us to... Burger King.

—LOGAN DECKER

MAXIMUM PC VERDICT 9

+ STEAK

Inexpensive, voice-prompting wireless GPS without monthly fees.

– STAKE

Despite a "high-sensitivity" mode, we still lost the GPS signal in some covered areas.

$300, www.belkin.com

Kyocera FineCam SL300R

Can a camera's looks compensate for a few flaws?

This snazzy-looking camera will impress your friends... until they use it indoors and wash out all their photos with the overly potent flash.

Sleek, and precious-looking, the Kyocera FineCam SL300R possesses a *Lord of the Rings* kind of appeal: Everyone who sees this shiny bauble of a digital camera becomes Gollum, unable to refrain from touching it.

Unfortunately, serious photographers who use the 3.2-megapixel FineCam in a day-to-day fashion will quickly get over the camera's impressive swiveling body and sharp looks and become frustrated with a flashbulb that's way too powerful, along with a few other flaws.

Casual photographers, however, should enjoy the FineCam's lightning-fast shutter speed. With just a 0.07 second lag, it overcomes the annoying delay that typically prevents mid- and low-end digital cameras from capturing spontaneous moments and events. The time between pressing the shutter button and the resulting shutter action is so brief, we were able to shoot spur-of-the-moment photographs with the FineCam as if we were using a non-digital camera.

What's more, by keeping the shutter button depressed, you can enter a continuous capture mode, where the camera will shoot and capture images nonstop at the rate of 3.5 frames per second.

Unfortunately, the camera's brutally powerful flash washes out anything and everything within a two to five foot range in a sea of unnatural, fluorescent-looking light.

With most cameras, you can simply turn off the flash if you're indoors and get nice, natural-looking images. Not so with the FineCam. When you turn off the flash, the camera's shutter speed doesn't open and close fast enough to compensate; flash-less indoor images suffer from motion blur at the default settings. You can adjust the shutter speed slightly by fiddling with the setup options—a "night" and "sports" mode are among the camera's six different settings—but this only barely corrects the problem.

Daytime usage is another story. With lots of light, the FineCam takes photos that look sharp and crisp. A 2x optical zoom allows you to get up close to your subject, and a digital zoom extends the zoom to 6x. Equally impressive is the movie mode; we haven't seen too many cameras this small shoot live action with such high quality.

—GEORGE JONES

MAXIMUM PC VERDICT 7

+ SMEAGOL

Slim, attractive, and takes great daylight images.

– GOLLUM

Flash is too powerful, and the swivel design makes it too easy to get fingerprints on the lens.

$400, www.kyoceraimaging.com

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*Leading stand-alone, branded monitor by sales (CRT and LCDs combined; iSuppli/Stanford Resources Monitrak® and Flat Panel Monitrak,® 3Q03 report). Specifications and pricing subject to change without notice. Corporate names and trademarks stated herein are the property of their respective companies. Copyright © 2003 ViewSonic Corporation. All rights reserved. [11507-00E-10/03]

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64-bit Mobos for the Masses

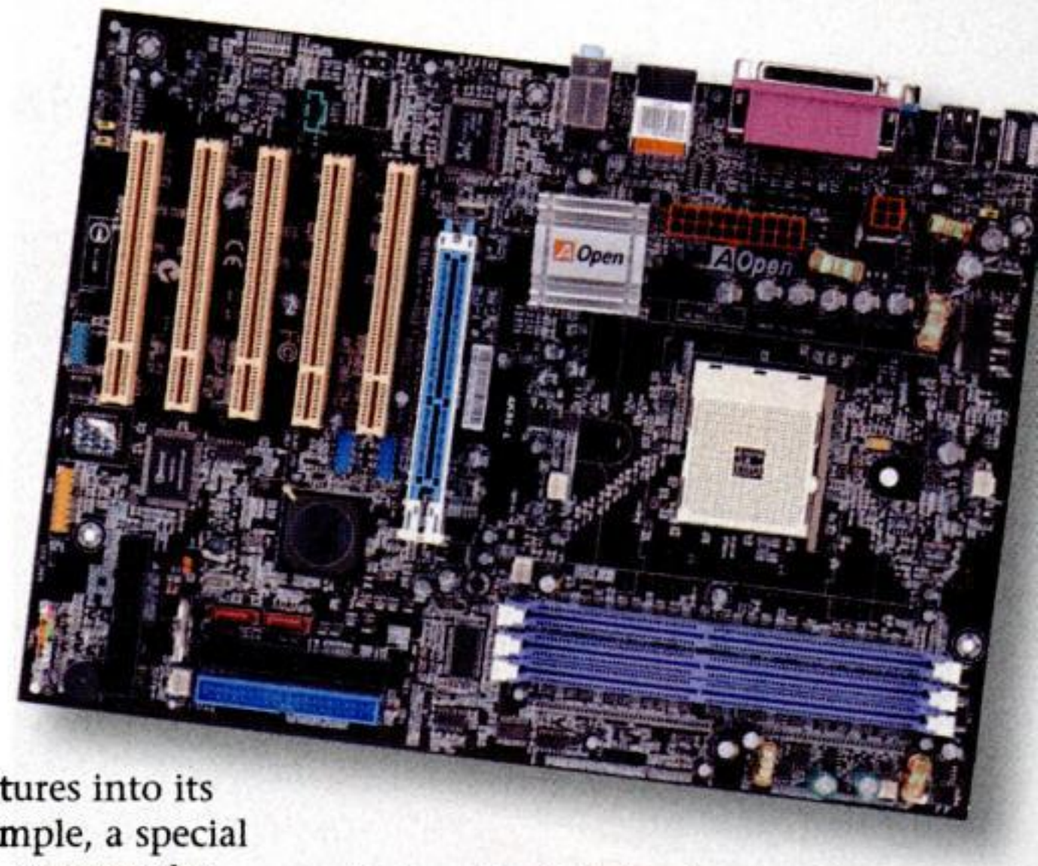
Three Athlon 64 motherboards encounter unexpected limitations

Not everyone can afford to build a top-flight Athlon 64 FX system. But that doesn't mean that a 64-bit OS and on-die memory controller are beyond the reach of regular folk. Consider Athlon 64. Coupled with VIA's red-hot Apollo K8T800 chipset, AMD's budget CPU series is anything but sluggish. In fact, the numbers we saw from the new Athlon 64 3400+ exceed those of the "normal" 3.2GHz Pentium 4.

Although we're convinced the Athlon 64 is a solid investment, if you have an eye toward upgrading, pay attention to AMD's plan to consolidate the platform around the upcoming Socket 939 platform. Still, according to AMD, Socket 754 will be a viable platform for at least 18 more months. And with the move to DDR2 and PCI Express this year, mobos are bound to become obsolete after 24 to 36 months anyway.

Here's a look at three motherboards that try to go the distance with the Athlon 64.

—GORDON MAH UNG



Although slightly slower, the AOpen worked with a wider range of RAM than the other mobos here.

AOpen AK86-L

A glance at AOpen's AK86-L specs would lead you to believe that this is a no-frills board. After all, it lacks FireWire ports, dual BIOS, and a plethora of parallel ATA ports. But you'd be surprised.

AOpen has tucked numerous features into its 64-bit mobo. For example, a special circuit in the AK86-L protects the motherboard from a PS/2 or USB short circuit. You know, like the last time you plugged in a PS/2 keyboard while the PC was on. Normally, that's an easy way to blow a mobo's circuit, but on the AK86-L, a miniature fuse/circuit breaker resets itself after an electrical short.

There's also a color-coded connector for the front panel connector that eliminates the pain of plugging in the power, reset, and hard drive connectors. AOpen uses a set of capacitors that are more than twice the size of caps used in most other motherboards (including the two others reviewed here). In theory, these higher capacitors help stabilize power going to the CPU.

RealTek silicon provides Gigabit Ethernet and AC97 5.1 audio. An extra we're not exactly sold on is its "Jukebox" feature. The technology lets you boot your PC in a few seconds so you can play a CD without waiting for the OS to boot. Why you'd want to do this, we don't know. Perhaps it would come in handy for home entertainment PC usage.

The AK86-L uses VIA's impressive Apollo K8T800 chipset, which has a reputation for being one of the fastest Athlon 64 chipsets around. We assumed chipset performance differences would be marginalized when the memory controller moved from the northbridge to the CPU in Athlon 64 chips, but it appears vendors are still managing to create some variance in speed. In VIA's case, the fast performance likely comes from the 16-bit, 800MHz Hyper-Transport link between the CPU and the northbridge. While competing chipsets use slower links, the K8T800 is a full-speed connection.

Performance-wise, the AK86-L places at the back of the pack, but by a speed differential of just a few percentage points. On a more positive note, the AOpen board was able to run all the RAM we threw at, while the Albatron K8X800 ProII and the MSI K8T Neo both experienced memory problems when using DDR400 in all three DIMM slots.

AOpen AK86-L

MAXIMUM PC VERDICT 8

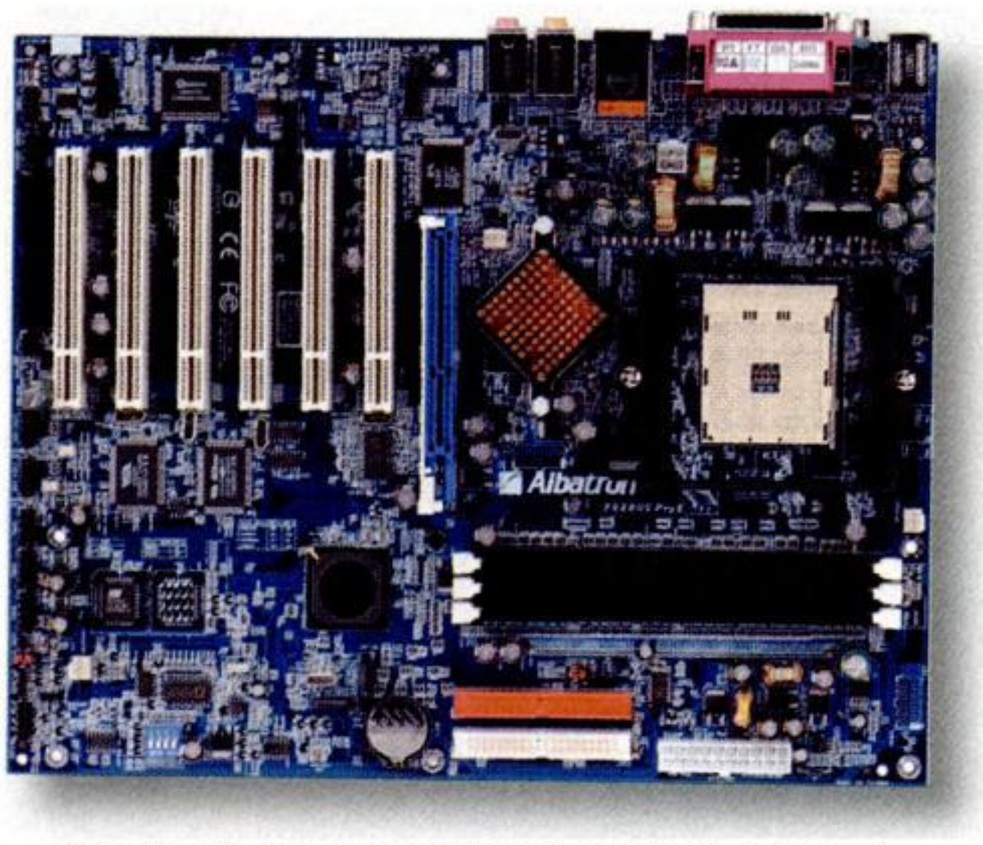
+ MERCEDES BENZ

Most compatible with the RAM we used.

– KIA

BIOS is soldered and not socketed, and the board lacks FireWire.

$125, www.aopen.com



Albatron's board features dual-BIOS, a ton of USB and FireWire headers, and six PCI slots!

Albatron K8X800 ProII

Albatron didn't skimp on the features when it forged the K8X800 ProII motherboard. It sports FireWire by way of a VIA VT6037 controller, a dual-BIOS feature that lets you recover your board should you nuke it during a failed update attempt, and even 24-bit audio (well sort of).

There's also a crapload of USB and FireWire headers on the board. Even though Albatron doesn't pimp a "resettable fuse" as a feature for the PS/2 ports, the board appears to have the same circuit as AOpen's AK86-L. Albatron even gives you a whopping six PCI slots. We're not sure what you'd fill them with, but hey, the more the merrier.

The board uses VIA's K8T800 chipset and VT8237 southbridge with SATA RAID. The VIA VT8237 also provides Serial ATA and RAID, but unfortunately lacks native SATA. That means you'll need to have a floppy drive and a set of drivers

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ready when you install XP. With boards using the Intel southbridge, Serial ATA drives can be used as seamlessly as a parallel drive. Count this as a negative in the VIA chipset column.

In our roundup, the K8X800 ProII solidly beat the MSI and AOpen boards. Granted, we're talking small percentages—but the K8X800 clearly led the field in most of our tests.

The only snag we ran into with the K8X800 ProII was when we filled all its DIMM slots. It choked on three 512MB modules but mysteriously ran fine when we put 256MB modules in their place. We initially suspected a defective mobo, but later came to believe that the K8T800 chipset is far more finicky with memory then we expected. It appears that three 512MB modules are more than it can handle. Interestingly, MSI's K8T Neo had similar, albeit more severe, problems. More on that later.

Of the three boards here, the K8X800 ProII has the most sophisticated audio. Using an Envy24PT chip, the board supports up to 7.1 audio. The board is also the first we've seen to offer partial 24-bit audio. We say partial because the 24-bit only works on the SPDIF-out via a Wolfson CODEC. The multichannel analog is handled by a VIA VT1616 CODEC which caps at 18-bit audio. Bummer. This means no 24-bit 7.1 sound. We still haven't seen a full 24-bit audio implementation from a motherboard vendor but expect to later this year when Intel's next-generation audio technology, code-named Azalea, hits the streets.

Based on performance and the inclusion of FireWire, 24-bit SPDIF output, and dual BIOS, the Albatron wins this roundup.

MSI K8T Neo-FIS2R

MSI's K8T Neo was the first board to arrive when AMD released the Athlon 64, so its teething pains don't surprise us. The first board we received suffered from a nasty little booting problem. When we shut down, it would restart only after we cut all power to the board for five seconds.

We attributed the problem to early engineering samples that sometimes go out to reviewers before they're ready for prime time. The replacement board we received didn't exhibit any of the power-on problems, so hopefully it's a bug confined to early builds that the public will never see.

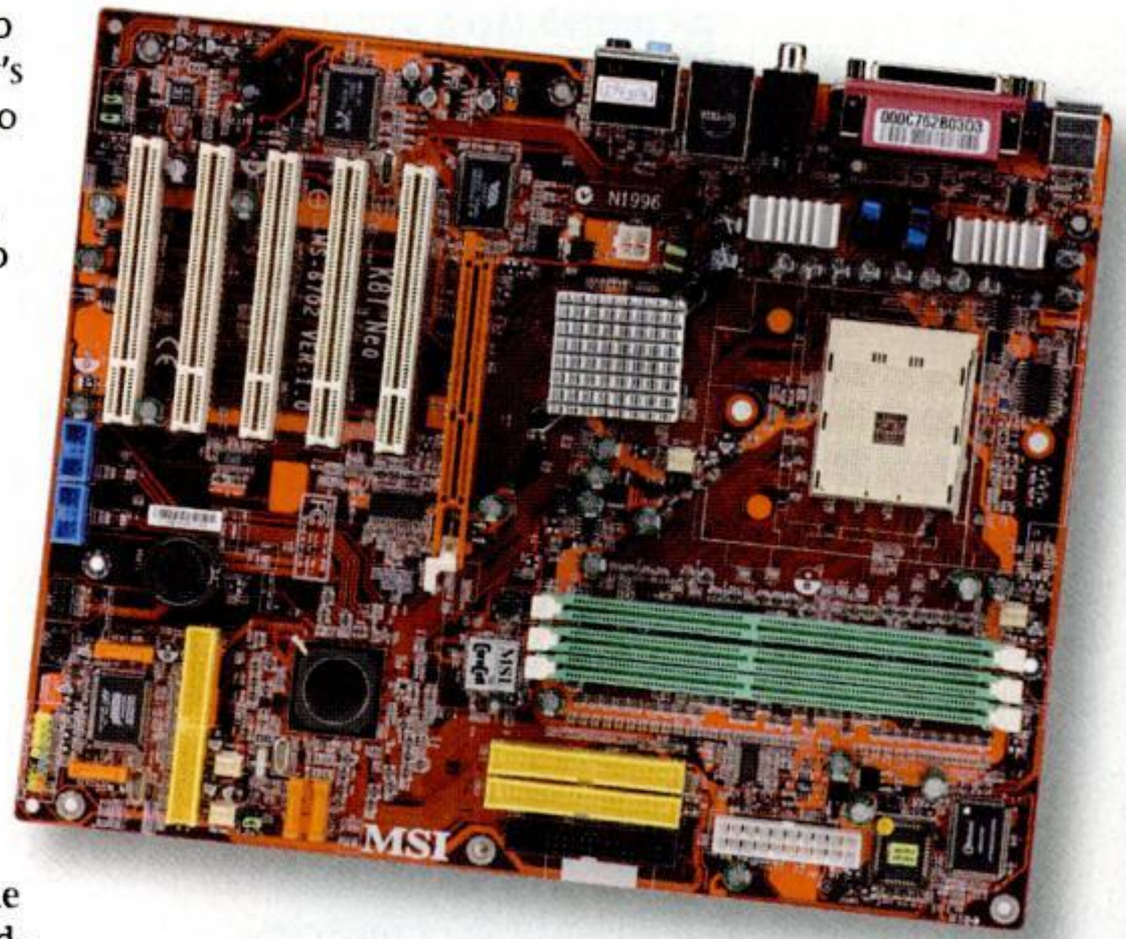
However, MSI was able to reproduce the problems we encountered when running 512MB Corsair Micro DDR400 modules. With two 512MB modules, the board wouldn't POST. We also tried various other 512MB modules, including Corsair's Pro Series and a set of the company's new XMS4400 modules, with no luck. We could only POST the board running 256MB modules or 512MB modules from Buffalo Technology. MSI told us it has replicated the problem and is talking with Corsair about the issue.

Given the on-die memory controller, do-it-yourselfers will definitely want to pay extra attention to memory configurations in the Athlon 64 series. We assumed that all three DIMMs on the mobos reviewed here could be run with DDR400 modules, but we were wrong. Technically, the A64 can only run DDR400 modules when just two of the DIMM slots are used. If all three slots are filled, you're limited to DDR333 or lower. This is an unexpected weakness of the Athlon 64: Anyone hoping to run 3GB of memory will have to notch their speeds down to 333MHz.

Once we got past these initial problems, we experienced smooth sailing. Performance-wise, this board places snugly between the Albatron and AOpen. Of the three boards, the K8T Neo has the most storage options, thanks to a secondary Promise controller that gives you another Serial ATA RAID option or the ability to run another parallel ATA device. This means you can run up to six parallel ATA drives plus four Serial ATA drives off this puppy.

FireWire is present in spades thanks to a six-pin and four-pin port running out the rear. Gigabit LAN and audio is handled by RealTek silicon.

MSI boards usually rate as our top picks, but the Corsair memory issue and the problems with the early board gave us a case of the willies and consequentially cost the board a few points. That's too bad, because we otherwise like the board's features and configuration.



The MSI mobo has the most storage options, but its finicky way with RAM spooked us.

Albatron K8X800 Pro II

MAXIMUM PC VERDICT 9

+ BATTLESTAR GALLACTICA

Partial 24-bit audio and dual BIOS.

– BUCK ROGERS

Not as compatible with memory as AOpen motherboard, and lacks a socketed BIOS

$130, www.albatron.com.tw

MAKER	AOpen	Albatron	MSI
Model	**AK86-L**	**K8X800 Pro II**	**K8T Neo**
SiSoft Sandra 2004 RAM	2971	**3061**	3037
3DMark2001 SE Overall	19914	**20278**	20048
QIIIA Demo 1 "Normal"	435	446	**447**
ViewPerf 3dsmax	12.19	**12.54**	12.29
ViewPerf Light-05	13.8	**14.29**	14.01

MSI K8T Neo-FIS2R

MAXIMUM PC VERDICT 7

+ CLONES

Multitude of storage options and a red PCB.

– ROBOTS

Problems with 512MB Corsair Micro modules.

$135, www.msicomputer.com

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Toshiba e805

Vibrant 640x480 VGA arrives on the PDA!

One of the most satisfying results of forking over a lot of dough for the latest technology is that it makes your friends look at their own gear with a sudden sense of embarrassing inadequacy. We call it the "locker room effect," and Toshiba's e805 handheld will have your peers blushing with envy when they check out its impressive VGA resolution. That's right: 640x480 on a Pocket PC screen—a first for the platform.

Squinting at this resolution on a 4-inch transflective display may not sound like a great time, but the crispness, clarity, and brightness of the screen immediately won us over (and made us wish the unit came with some sort of screen protection, even a rudimentary sleeve, which it does not). Still, there's a hitch. Switching into VGA mode performs a soft reset on the device, and when the e805 assumes its 640x480 glory, you'll find that only four applications are available: *ClearVue Document*, *Spreadsheet*, *Presentation*, and *Image*. These apps will allow you to view *Microsoft Word*, *Excel*, and *PowerPoint* files, but you can't edit them. *ClearVue Image* allows you to view images in common formats such as JPG, BMP, and PNG.

Windows Mobile for Pocket PC 2003 doesn't have built-in support for VGA resolution (it's expected in the next iteration of Mobile), so the paucity of application support is no doubt a result of not being able to guarantee compatibility with applications that didn't anticipate VGA resolution on a handheld. Power users don't have to abide by this restriction, though. A third-party utility called *ResFix* allows all applications to work in VGA mode (see the sidebar).

As you'd expect from such a groundbreaking device, its guts are just as intimidating as its display. The e805 uses Intel's PXA263 proc running at 400MHz with 128MB SDRAM memory, and the video is powered by an ATI chip with an unprecedented 2MB of video memory. There's also 32MB of CMOS Flash ROM for the OS, and another 32MB Flash ROM disk that's protected from erasure during a hard reset for saving application data. CompactFlash (Type I and II) and an SD slot are available for external storage.

The e805's built-in mic and speaker are huge improvements over previous Toshiba handhelds. And we're pleased that the Wi-Fi range seems to be slightly greater than that of the iPaq 5555. An optional "Presentation Pack" ($100) brings out the best of the VGA screen with an RGB port for external monitors and a USB adapter for use with external peripherals.

Unfortunately, the telescoping stylus is horrible, and needs to be jettisoned in the next revision.

Dazzling and droolworthy, Toshiba's e805 introduces the finest screen ever to grace a Pocket PC. Can you say 640x480?

With all this processing muscle, you'd expect the e805 to be a sweet gaming handheld. While its four-way d-pad can transform into a nice eight-way pad, a significant button lag is a real pain in the arse for action gaming. Otherwise, only the iPaq 5555 can challenge the e805 for quick arcade fixes.

While the luscious picture is a terrific leap forward for handhelds, the e805 gets held back by the limited implementation of the VGA screen. It's a must-have only for guys and gals who want a top-of-the-line handheld with just about every feature in the book (with the notable absence of Bluetooth) and are willing to pay top-dollar for it.

—LOGAN DECKER

MAXIMUM PC VERDICT 9

+ SILVER SCREEN

Enough hardware muscle for games and video, and the exclusive VGA mode is breathtaking.

− BLUE SCREEN

Optimum VGA requires a third-party hack; very expensive; frustrating button lag.

$600, www.toshiba.com

ResFix—All VGA, All the Time

If you decide to buy Toshiba's e805, you absolutely must download *ResFix*. Two versions are available; *ResFix 1.0d* is a basic utility that allows any application to be displayed in VGA mode. This doesn't guarantee the applications will display correctly, but even reluctant applications will usually display in one-quarter of the screen. The catch is that you cannot use Toshiba's resolution-changing utility after installing *ResFix*. Doing so will force you to perform a hard reset to recover.

ResFix 1.0d is free, but for $10, you can buy *ResFix 2.0*, which allows you to rotate the screen into landscape mode so applications display as they would on a 640x480 monitor. Check out **home.comcast.net/~swdeveloper/** to download this utility, and to see photographs of *ResFix 2.0* in action.

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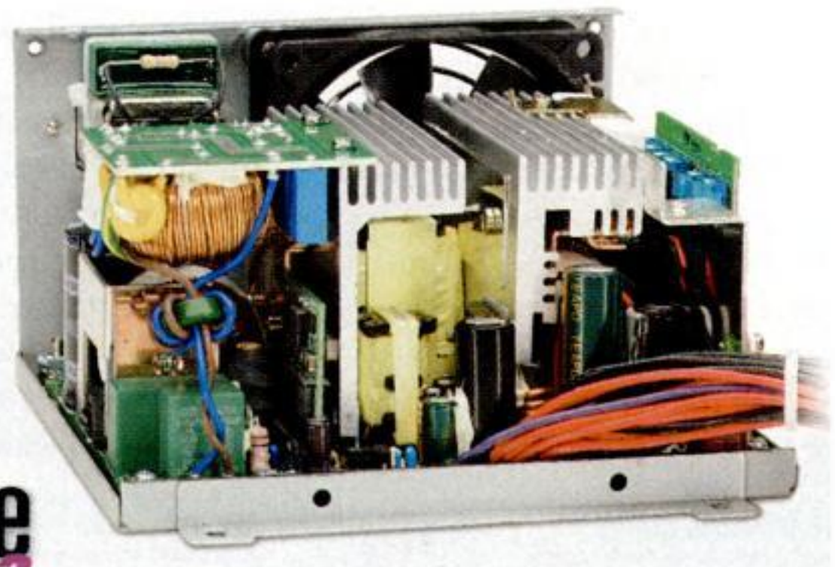

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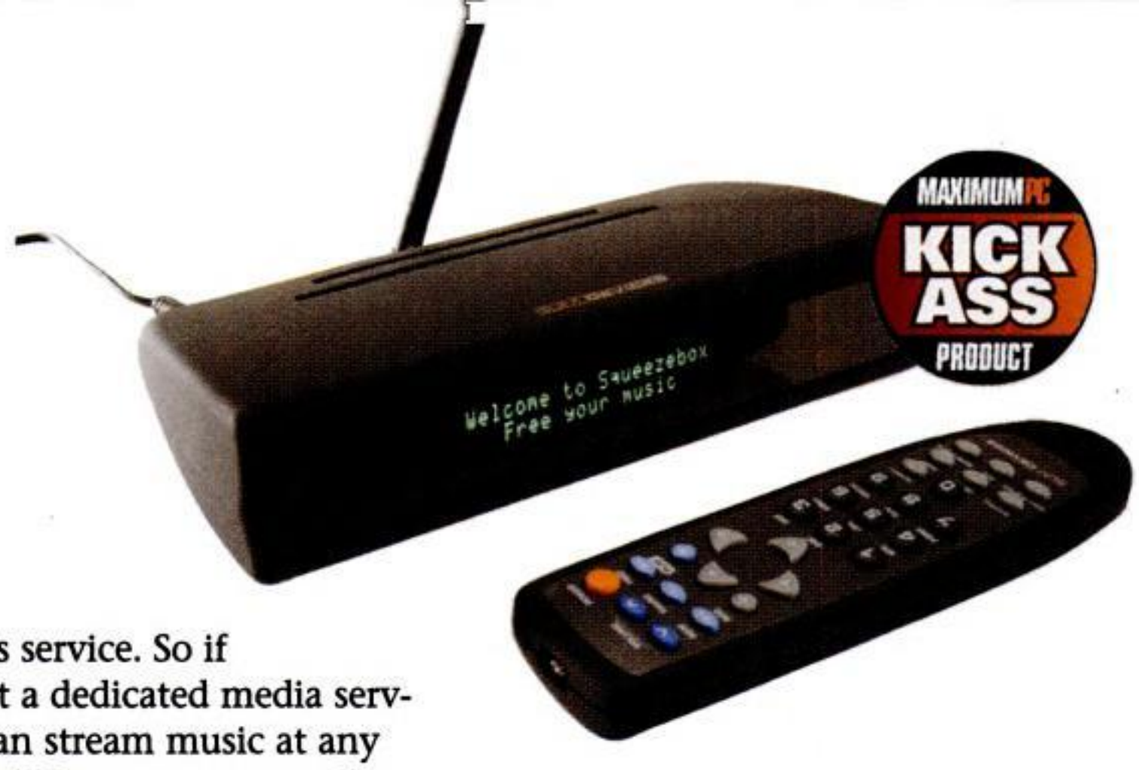
Wireless Music Players

Stream MP3s from your PC to your living room stereo



The Squeezebox's easy-to-read interface lets us tune surf from the couch, which makes us giddy.

What good is 150GB of MP3s if you can only listen to them through your PC speakers and not the kickin' sound system in your living room? If your PC and stereo are in the same room, connecting the two is as easy as running a cable between the two. But what if your PC is on the other side of the house? Not only is it inconvenient to string a cable through multiple rooms, but sound quality is degraded by the use of longer audio cable. We've tested several different MP3 streaming solutions in the *Maximum PC* Lab and these are two of the best we've seen to date.

—WILL SMITH

Creative Labs Wireless Music

The Creative Labs package includes a Wi-Fi base station and an impressive remote control. Instead of putting a small, difficult-to-read LCD on the base station, Creative innovatively incorporates the LCD, used for browsing and selecting songs, into the remote control.

Configuration is simple. You install the Creative Labs software on the PC that houses your digital music, plug the streaming box into that PC's USB port, and input your wireless network's settings. After that, you disconnect the wireless box from your PC and connect it to your stereo, using either an analog or Toslink optical digital connection.

The Wireless Music's remote sports an LCD screen, saving you from squinting at a tiny screen on a far away base station when you want to find music.

The Wireless Music device uses Creative's *MediaSource* jukebox software to itemize all your digital music, and a system tray applet to share music with up to four receiver boxes. Unfortunately, this server applet has some problems. First, the applet consumes at least 20MB of your PC's RAM, which is much more than any streaming applet we've seen (most use between 1MB and 5MB of RAM). The applet also runs only in the system tray, and not in the background as a Windows service. So if you want a dedicated media server that can stream music at any time, you'll have to perpetually leave an account logged into Windows.

The audio quality sounds fantastic with both the analog and digital outputs. Unfor- tunately, playback wasn't flawless, even with high-quality MP3s. Sometimes when you change tracks, the next song starts, then hiccups, then continues. We expect better from a $200 product.

The screen on the remote control makes navigating even huge music collections a snap. You can sort tracks by artist, album, or genre. Sadly, Creative's software occasionally fails to detect ID3 tags for songs ripped using other programs. Without the information in the ID3 tags, it's impossible to determine whether a tune is by the White Stripes or Mariah Carey without listening to it. That's just not cool.

Slim Devices Squeezebox

At first glance, you might be unimpressed by the plain vanilla remote control and small black box sporting a two-line LCD display. But despite its humble appearance, the Squeezebox is the perfect digital streaming box for music enthusiasts.

You install the open source server software—called *Slimserver*—on the PC housing your MP3 collection. We used the Windows version, but OS X and Linux versions are also available. Via an easily readable display, you can effortlessly configure the Squeezebox for either a wired Ethernet network or a Wi-Fi wireless connection. You also have the option of installing the server software as a Windows service, which means it'll run anytime the machine is on, whether or not an account is logged in.

The Squeezebox has analog RCA, coaxial SPDIF, and a Toslink optical SPDIF output. Sound quality is exemplary. Every aspect of the Squeezebox's interface is configurable in the *Slimserver* software, from the size of the display to the way tracks and titles are listed. It's fast and easy to browse even enormous music collections using the search functions.

To search by artist, album, or track, key in the first few letters of the name and press enter. The Squeezebox will list all the choices that match up with your search. In addition to the search function, you can also browse by genre, artist, album, or track title. The *Slimserver* software even parses the MP3 tags that the Creative software ignores.

Because *Slimserver* is an open source application, there are dozens of useful user-created plugins. With the right plugins, your Squeezebox can even display the local weather forecast, news updates, and serve as a smart alarm clock. Using the LAME encoder, you can stream anything to your Squeezebox that you can listen to on your PC, from Internet radio to songs from Rhapsody.

Creative Wireless Music

MAXIMUM PC VERDICT 7

+ 192 KBPS

The remote's screen makes couch browsing easy, even with large music collections.

– 48 KBPS

The hiccups on startup is unacceptable, and the server program should be a background service.

$250, www.creativelabs.com

Slim Devices Squeezebox

MAXIMUM PC VERDICT 10

+ MILHOUSE VAN HOUTEN

The excellent interface and server software make this a must-have for any audiophile.

– RICHARD MILHOUS NIXON

Three hundred bucks is a tad expensive, but the Squeezebox is worth every extra penny.

$300, www.slimdevices.com

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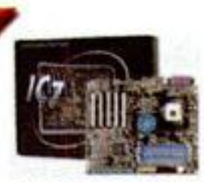

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Addonics 18-in-1 Multi-Function Recorder

The ultimate media reader or flea market fodder?

Photographers, journalists, and private investigators, take note: You'll never, ever run out of memory card space with the Addonics MFR, which can perform 18 different media-related tasks with virtually all of your storage media.

The phrase "18-in-1" suggests the sort of device that seems really appealing in an infomercial, and then is used exactly once before being forgotten in a dusty kitchen drawer. But the Addonics Multi-Function Recorder (MFR) actually earns its title as the ultimate media reader for home and mobile use. If you can't imagine why you'd need something like this, you probably don't, so you may now retire to the drawing room. Otherwise, let's look at the specs.

The MFR is a removable laptop DVD-ROM/CD-RW combo drive outfitted with a small LCD screen and a USB 2.0 connection. It accepts CD-Rs, CD-RWs, CompactFlash Type I and II, Memory Stick, Memory Stick Pro, SD cards, MMC cards, and Microdrives. (*Whew.*) The Addonics MFR also reads DVD-ROMs, and though the box only mentions support for the recordable DVD-R/W format, we were pleasantly surprised to find that ours had no problem reading from DVD+R and DVD+RW discs as well (it will not burn to DVD, however). The only thing missing from the line-up is Olympus' new camera-centric xD format, which is no biggie.

Operation is exceedingly simple; just pop a storage card into the slot located above the disc tray, and the LCD asks if you want to back it up to an optical disc (the drive supports multi-session burning). One button begins the process. CD writing tops out at 24x, but your backup times will be limited by the transfer rate of your storage card. Unfortunately, the Addonics drive doesn't support disc spanning, so there's no way to back up storage cards that have capacities greater than a 700MB CD. One technical problem we encountered is that frequent card-swapping sometimes caused the unit to hang, forcing us to unplug it in order to reboot it.

The MFR comes with a ton of handy features and accessories, such as automatic playback of images on a storage card to a television using the S-video out and included remote control, a clip-on battery pack that lasts a little more than two hours, and every cable you'll need for the unit packed into a handy travel case. But the real payoff is for photographers and anyone else who juggles memory cards in multiple formats away from their PCs.

—LOGAN DECKER

MAXIMUM PC VERDICT 8

LIGHTHOUSES

The MFR is just as convenient to use on the go as it is at home.

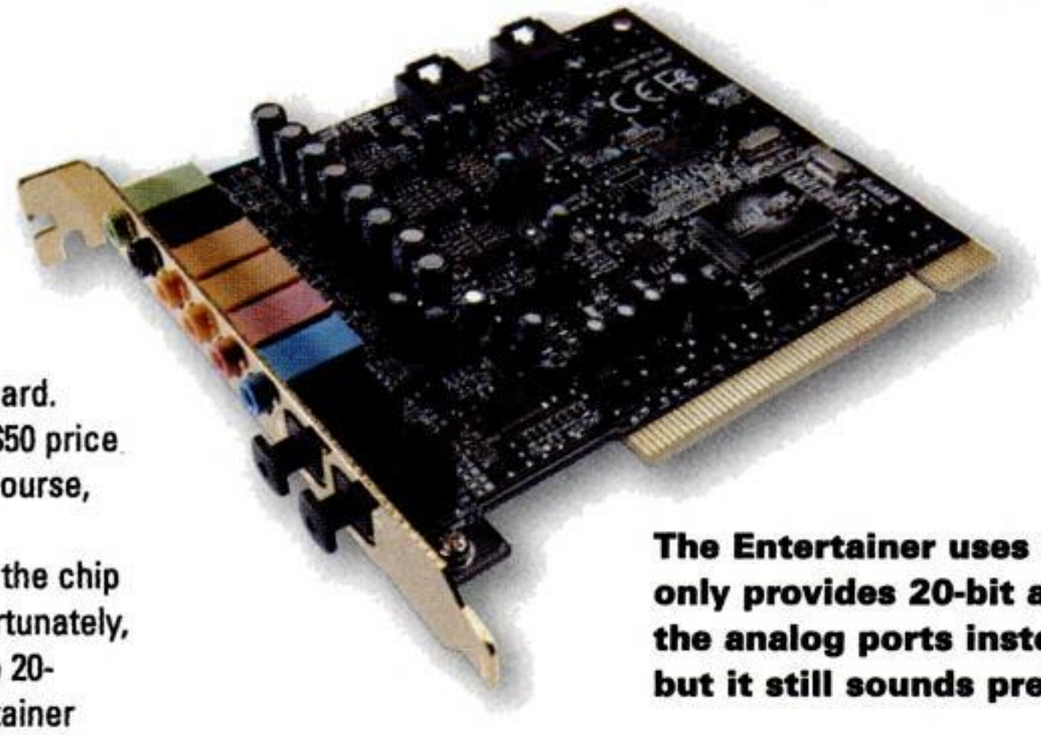
OUTHOUSES

DVD read speeds are very slow, and the drive doesn't support disc spanning.

$300, www.addonics.com

Mad Dog Entertainer 7.1 DSP

This inexpensive surround-sound card slips a bit, but still surprises us



The Entertainer uses a VIA chip that only provides 20-bit audio through the analog ports instead of 24-bit, but it still sounds pretty good.

Cost is no longer a reason for passing up a 7.1-capable soundcard. Mad Dog's Entertainer 7.1 budget soundcard breaks the sub-$50 price barrier while giving you eight discrete channels of audio. Of course, the low price comes with a few compromises.

The Entertainer uses VIA's Envy 24 HT-S chip, which is similar to the chip found in M-Audio's Revolution 7.1 and AudioTrak's Prodigy 7.1. Unfortunately, the "S" version of the popular VIA audio chip limits analog output to 20-bit, not 24-bit like the aforementioned soundcards. Even if the Entertainer had the higher-end chip, the VIA VT1616 CODEC limits you to multichannel surround sound. Because the VT1616 is confined to six-channel output, Mad Dog added a second high-quality Wolfson CODEC for the last two channels. Thus, the "24-bit" descriptor can be chalked up to marketing gimmickry.

The truth is, the card provides 24-bit only on the optical-out and not the analog, which is what most people will use it for. Mad Dog also takes liberties in describing the soundcard as having a digital signal processor (DSP). This sounds like hype to us—as far as we know, the Envy 24-series of chips does little if any processing of signals; it's all done on your CPU. We also ran into problems updating the Entertainer's drivers using Mad Dog's web site. When we went from the stock drivers to the latest drivers, we lost the ability to drive eight-channel audio. That's bunk.

Still, there is some good news in the dog pound. Even though we've seen similar onboard solutions using the same components as the Entertainer 7.1 (the Albatron Athlon 64 board on page 66, for example), the Entertainer performed above average for a budget card when playing high-resolution source material. Perhaps just moving the components to a PCI card and away from the noisy confines of a mobo makes the difference. Mad Dog's card isn't in the same class as Creative Lab's Audigy 2 ZS or M-Audio's Revolution 7.1, which uses an AKM CODEC, but for a list price of $60 (and we've seen it sell for as low as $20), it's a steal, especially when you consider that you get a pair of optical ports as well.

The Entertainer's gaming performance is about what we expected from a host-based soundcard. It's good if your PC has the CPU equivalent of a beefy Alaskan husky. If your processor is more of a poodle, you may want to opt for a more traditional hardware accelerator.

—GORDON MAH UNG

MAXIMUM PC VERDICT 6

SCOOBY-DOO

For less than the price of a good mouse, the Entertainer 7.1 serves up more satellites than Neptune.

SCRAPPY-DOO

Doesn't live up to box claims of "24-bit" or DSP. Doesn't work with Creative 7.1 speakers.

$59, www.mdmm.com

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Iogear MiniView III USB KVM

This no-frills switch allows you to share your keyboard, monitor, and mouse with other PCs

Extra monitors, begone! A good KVM switch, like the MiniView III, can save precious desk space by letting you connect more than one PC to your keyboard, mouse, and monitor.

Many PC geeks feel compelled to run more than one PC, which is great—unless you're confined to a small space. In such cases, connecting a keyboard, monitor, and mouse to each PC is problematic, not to mention costly. We avoid unsightly clutter with the KVM (keyboard, video, mouse) switch, a space- and cash-saving alternative that allows you to share one set of peripherals with every PC in your menagerie.

Iogear's MiniView III shares your monitor, USB keyboard, and USB mouse with up to four PCs. Setting it up is simple; you run a cable with a VGA connector and a USB plug from each PC to the KVM, connect the monitor, keyboard, and mouse to the KVM, and add power. Unlike other KVM switches, the MiniView actually includes the VGA/USB cable for all four PCs. Measuring less than five feet, these cables are shorter than we'd like, but we can't argue too much—most other KVM manufacturers charge extra for cables. Changing which PC your keyboard and mouse are connected to is as easy as pressing a button on the KVM or hitting a keyboard shortcut.

Image quality with the provided cables is acceptable for the most part. We wouldn't recommend running any resolution higher than 1600x1200, but at 1600x1200 @75Hz we experienced no hint of fuzziness or distortion. The keyboard and mouse function without any additional lag or errors, and games work just as well with the KVM as without it.

We are perplexed by one design decision, though. The MiniView III includes a pair of spare USB ports for printers, cameras, or removable storage, but they're inconveniently located on the back of the KVM. Why place the mostly permanent connection point for the USB keyboard and mouse on the accessible front panel and the more temporary spare ports on the hard-to-reach backside?

We expect KVM switches to become de rigueur for power users and people running small home servers, and while the MiniView III represents a fairly bare-bones approach, it's a solid choice. It sure beats adding a second, third, or fourth monitor to your already crowded work area.

—WILL SMITH

MAXIMUM PC VERDICT 8

+ KVM

Works as advertised, without degrading image quality or adding keyboard wonkiness.

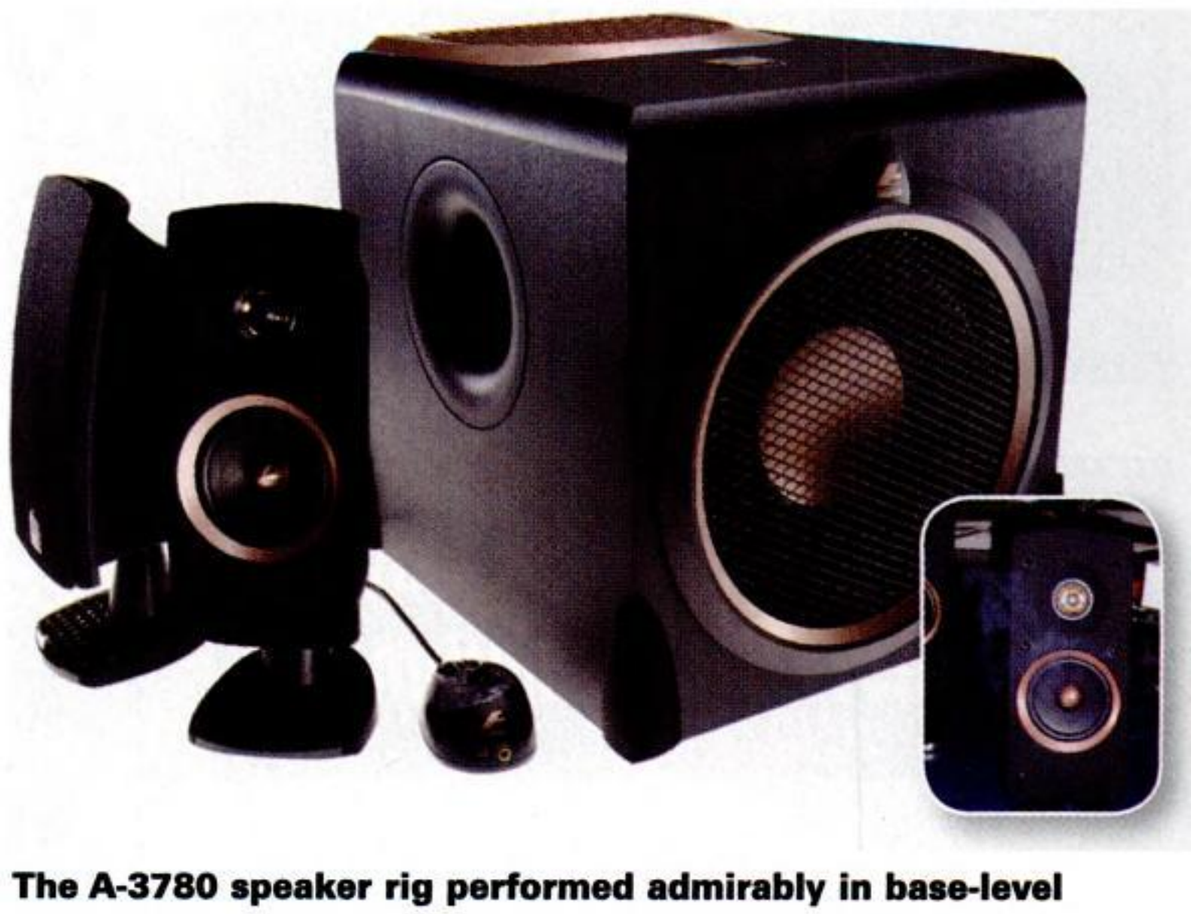
– KIA

The spare USB ports on the back should be swapped with the keyboard and mouse ports up front.

$200, www.iogear.com

Acoustic Authority A-3780

This low-cost speaker set is literally sssssssmokin'!



The A-3780 speaker rig performed admirably in base-level tests, but exploded under the pressure of *Maximum PC's* rigorous Lab tests (see inset photo).

Never heard of Acoustic Authority? Neither had we, but we'll test any product sent to us for review if it offers tangible benefits to you, the reader. The hook with the A-3780 is that this speaker setup is quite affordable given its high level of specification. It's not often we see a $100 set of speakers with an 8-inch subwoofer as well as two-way satellites. On paper, the rig seems like the bomb. Lab testing revealed further bomb-like characteristics, but not of the good variety.

We began the A-3780's Lab workout with some casual MP3-ing and gaming, and the speakers fared quite well. Under normal listening conditions they produce deep bass, crisp highs, and punchy midrange. Everyone who heard the speakers during this preliminary testing phase was impressed with their power and sound quality, especially given the low price. We even switched back and forth between the A-3780 and Logitech's Z-2200, which received a 9/Kick Ass in February 2004, and decided the two speaker sets were comparable. The Logitech speakers offer a tighter overall sound with more clarity and power, but the A-3780 is in the same ballpark—quite a feat for an unknown brand.

With casual testing complete, we moved on to more rigorous testing with our regimen of test tones. The speakers handled the first few tones just fine, but in the middle of our 20Hz to 22KHz sweep we heard a "pop" from the left satellite and noticed a rising wisp of smoke. Uh oh. Something inside the speaker was amiss. Undaunted, we let the test continue and then ran it one more time. During the second run the right satellite blew as well, rendering both satellites lifeless. We tested a second set of speakers to see if this was an anomaly, but it wasn't. The second set expired in a plume of smoke too.

So there you have it. These speakers performed quite well during casual testing but expired quickly during benchmarking. We're sure the chances are slim that you'll be listening to signal sweeps on a regular basis, but the fact that they can't take the heat makes them tough to recommend.

—JOSH NOREM

MAXIMUM PC VERDICT 3

+ SKINNY DIPPING

Awesome power and sound at reasonable volumes.

– SPEAKER CLIPPING

Questionable long-term viability; speakers blew out in testing.

$100, www.cyber-acoustics.com

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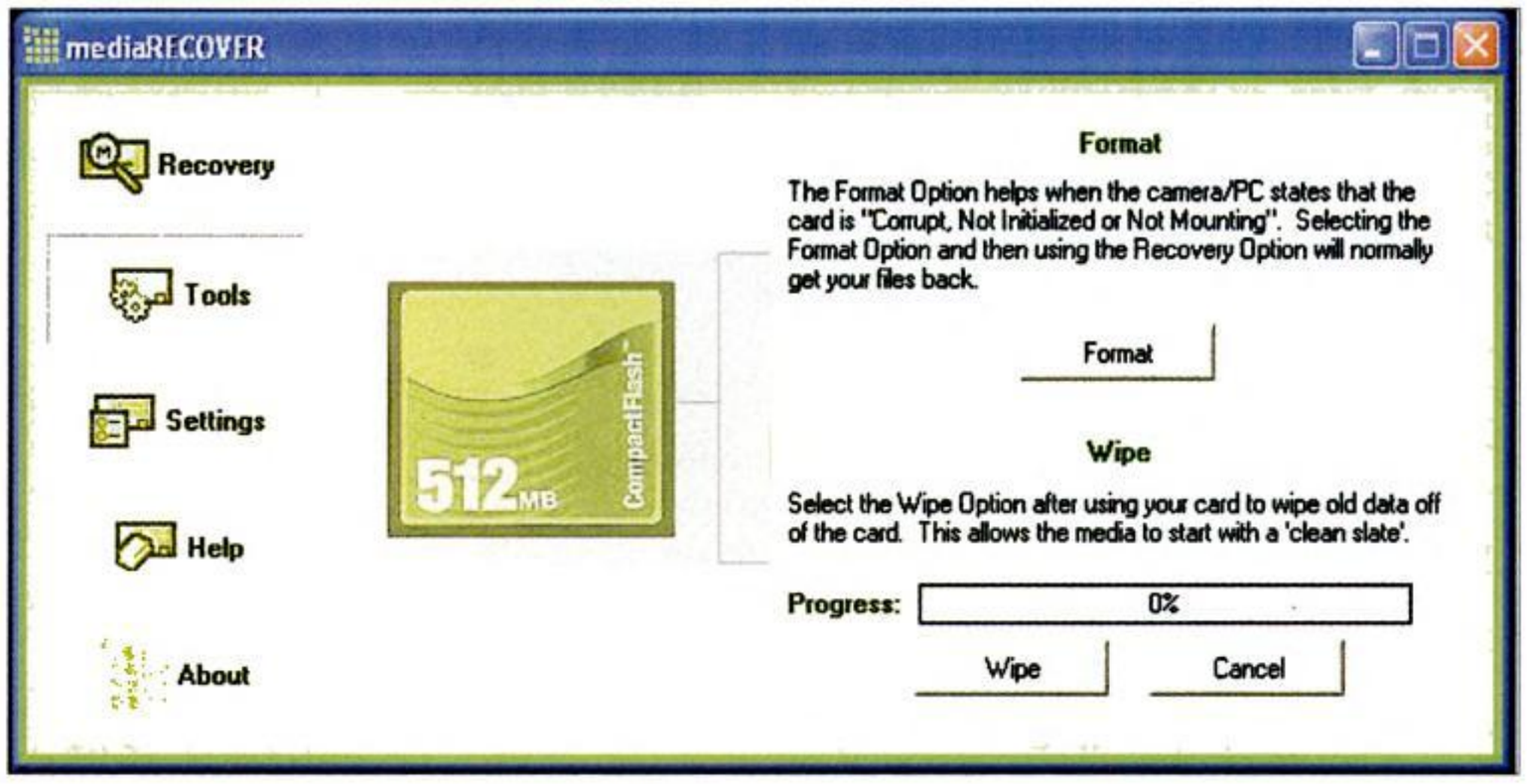
MediaRecover

Restart your heart and recover your photos with this recovery app


mediaRECOVER
Recovery
Tools
Settings
Help
About
512MB
CompactFlash
Format
The Format Option helps when the camera/PC states that the card is "Corrupt, Not Initialized or Not Mounting". Selecting the Format Option and then using the Recovery Option will normally get your files back.
Format
Wipe
Select the Wipe Option after using your card to wipe old data off of the card. This allows the media to start with a 'clean slate'.
Progress:
0%
Wipe
Cancel

A quick format may let you recover some images from a corrupt memory card.

There is no more gut-wrenching feeling than the internal lurch that occurs when you accidentally hit the erase button on your digital camera before saving the images to your PC. Fortunately, *MediaRecover* can save the day in the event of such idiocy. By letting you easily recover data from formatted, erased, or corrupted memory cards and other smart media, this app can handle the majority of the devastating digital situations that cause your heart to stop beating.

In our tests, we easily recovered erased and formatted files from a card with 100 percent reliability when we attempted recovery immediately after the files on the card were erased or formatted. We also recovered some of our images after formatting and then writing additional images to the card. We did finally foil *MediaRecover* by ejecting and reinserting the card during a recovery effort. This scrambled the card's data permanently and consequently limited our recovery to just JPG file fragments. One nifty feature of *MediaRecover* is its ability to format a corrupt card. After formatting, you then run *MediaRecover* on the card and hopefully recover some or all of the files.

We like the simple-to-use interface and easy-to-comprehend explanations, but it would have been nice if the program could do a sector by sector scan to search for lost images and perhaps even display them graphically. For 99 percent of situations, *MediaRecover* will do a fine job. For that tough—and usually critical—extra one percent, you're going to need the help of the data gods on your side.

—GORDON MAH UNG

MAXIMUM PC VERDICT 9

+ LEICA

"Keep it simple, stupid"-interface does the job in 99 percent of cases.

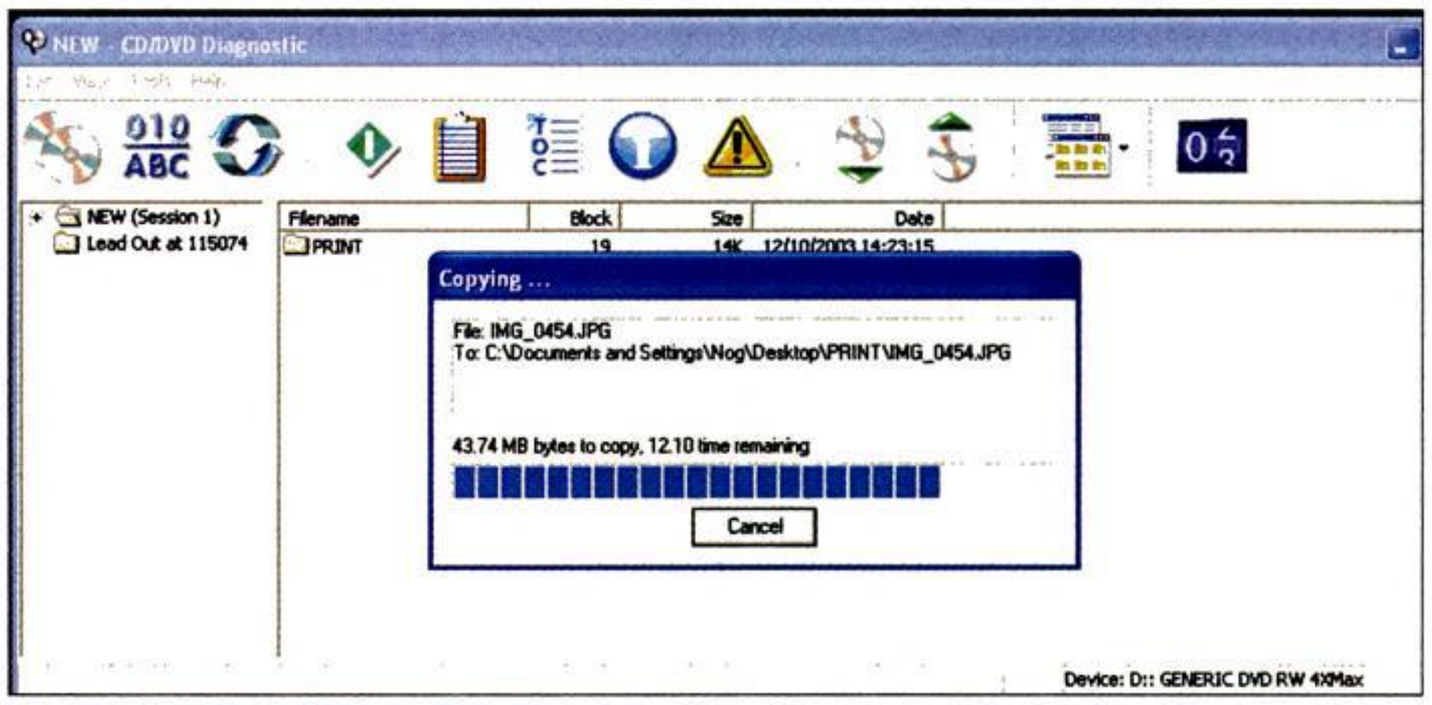
– KODAK DISC CAMERA

Could use a few more hardcore features.

$40, www.mediarecover.com

Arrowkey CD/DVD Diagnostic

A lost and found department for your CD and DVD data



It can take an hour to recover data from a badly scratched disc, but it's worth it.

If you think a CD-R will give you 25 years of trouble-free storage, think again. Sunlight, scratches, acidic inks, and even the glue from a label can all destroy precious data on a disc. Thankfully, when your data goes bad, you don't have to sit screaming like an angry Klingon. Not when Arrowkey's *CD/DVD Diagnostic* can help in the healing.

Based on the company's forensic tool for cops, *CD/DVD Diagnostic* is designed to recover the unrecoverable. Perfect for those times when your software fails to close a CD session, or any of the other hardware bombs that tend to zap disc data dead.

In our Lab tests, we challenged the app with media scratched to various degrees. We scraped one CD on the walls of the *Maximum PC* offices, gave a second CD about 30 lashes with a box cutter, and rubbed a third CD raw with the back of a motherboard. All three CDs were nonfunctional and locked up the machines we put them in for 15 minutes. Then we set *CD/DVD Diagnostic* to work. Remarkably, the app was able to recover about 90 percent of the files from the disc that received the stucco-wall treatment. On the other hand, the program fared poorly with the disc that scuffled with our box cutter, failing to ever even recognize the mangled CD-ROM. The disc that went toe-to-toe with the mobo had about a 50 percent recovery rate. While certainly not a cure-all, the prospect of recovering just 50 percent of your work can seem like a godsend when you're standing at the precipice of complete data destruction.To be fair, we have to point out that readability is greatly affected by the drive that's being used. According to Arrowkey, the slower the drive, the better its chance of recovering data.

CD/DVD Diagnostic's recovery process is by no means speedy. It took us more than an hour to complete some of the recovery attempts, which is a long time to be biting your nails in the hopes that your data isn't dead. We understand that it takes time to read data from a CD or DVD that's been mutilated, but faster operation would go a long way toward excusing the app's spotty success rate.

—GORDON MAH UNG

MAXIMUM PC VERDICT 8

+ ALCOHOLICS ANONYMOUS

Hell, we're amazed it could read even a portion of our slashed up discs.

– VIDEO GAMES ANONYMOUS

Can take more than hour to recover the data; the interface looks like a shareware Visual Basic app.

$49, www.arrowkey.com

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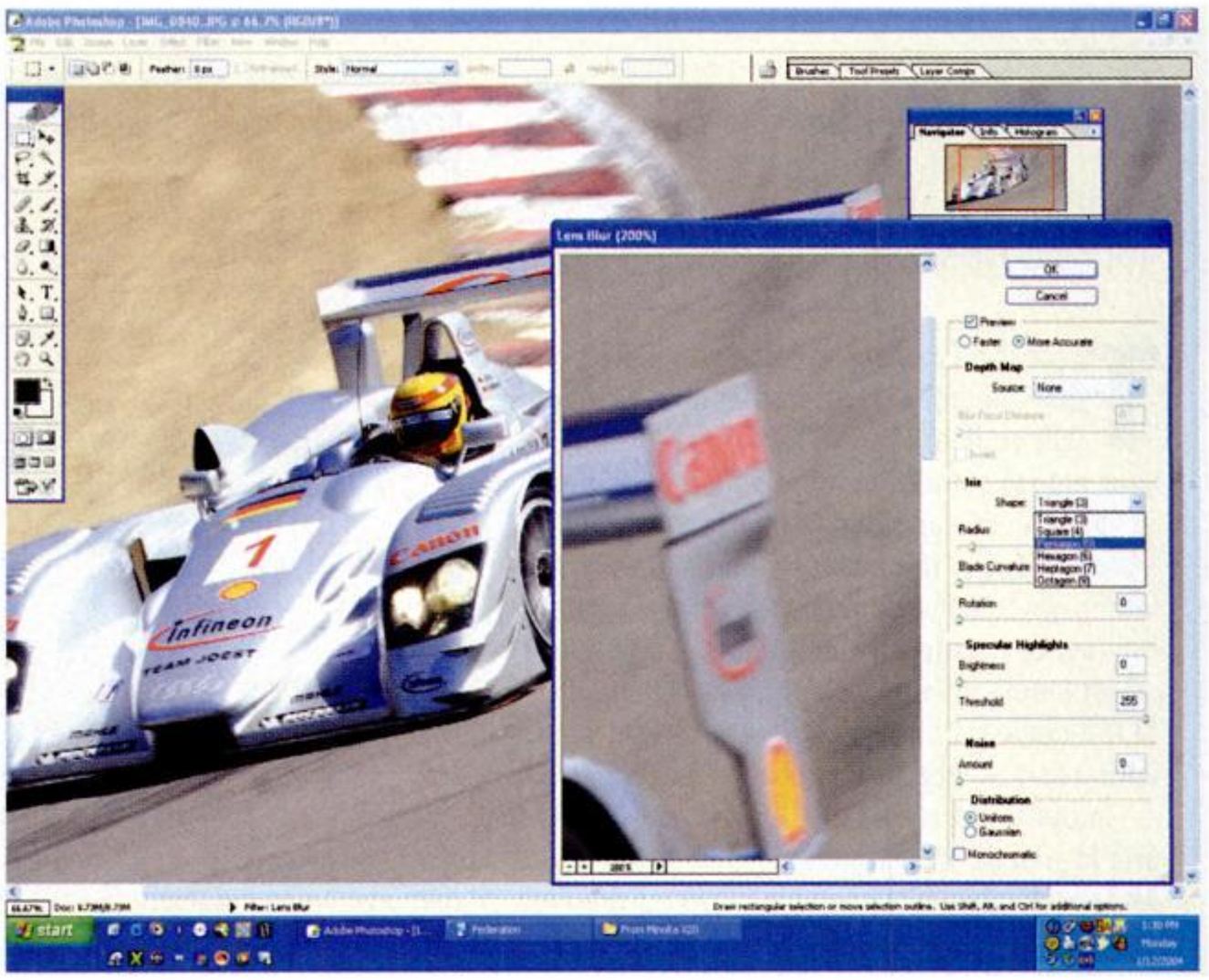
Adobe Photoshop CS

The biggest *Photoshop* update to date



***Photoshop CS* lets you control the focus by specifying how many aperture blades you want in your faux lens filter.**

When you own a monopoly on desktop image editing software, innovate leaps tend to be few and far between. While some of Adobe's upgrades to its flagship *Photoshop* app have seemed to go no further than the splash screen, the company must have threatened to off-shore its programmers this time around, because the app is drastically improved. *Photoshop CS* receives more than a new name; it also gets a healthy dose of additional features that would normally take two or three years to be released.

MAXIMUM PC KICK ASS PRODUCT

Digital photographers will feel like this version of *Photoshop* was made just for them. To start with, you no longer need to purchase RAW format support as a separate $99 package. It's now built in, and the list of supported cameras is longer than ever. *Photoshop CS* also recognizes EXIF metadata, such as the orientation instructions embedded in digital cameras, so you won't have to flip your vertical images anymore.

That's just the tip of the iceberg. Dig deeper, and you'll find that *Photoshop CS* features the best tool to date for controlling depth-of-field: Lens Blur. This neat filter allows you to mimic the out-of-focus effect generated by a real lens. You even get to customize the characteristic of the lens by defining the number of aperture blades, the aperture size, the depth of focus, etc.

Less technical in nature, but just as useful, are two new features known as Match Color and Highlight/Shadow Correction. As their names suggests, these allow you to match the color of two images and correct for tonal imbalance, respectively. If that's not enough, you'll find Adobe has added a collection of 18 photographic filters to the Adjustments menu.

Sparkling new photo-editing tools aside, *Photoshop CS* also introduces a number of noteworthy—and let's face it, belated—practical enhancements. The program now supports comprehensive 16-bit per-channel (48-bit color) image editing, rather than limiting users to a few filters and practically no tools. Moreover, non-square pixel support is now available, and users can finally place text on any defined path.

The latter feature, in our opinion, is way overdue. Traditionally, *Photoshop* could only place text horizontally, vertically, or along a few preset curvatures, and this kind of archaic rigidity has grown into a huge annoyance.

Photoshop CS can also automatically crop and straighten photos with clearly defined borders. This feature is frequently included in rudimentary scanning applications and TWAIN drivers but has been strangely missing from past versions of *Photoshop*.

Computing hardware has progressed to the point where just about any decent system built in the last several years is able to run *Photoshop* without seriously testing the user's patience. However, the speed freak within us feels obliged to point out some bad news (or good news, depending on whether you sell CPUs). In our tests, we found *Photoshop CS* to run a bit slower than *Photoshop 7.0* on home brew action script. On both our Athlon 64 FX reference box and a Pentium 4 Extreme Edition, the new version of *Photoshop* had a run time that was about 20 percent longer than its predecessor's. We're investigating this issue further with Adobe and will present the results in our In The Lab section in a future issue.

Without a doubt, this new version of *Photoshop* puts forward more new features than Adobe has ever crammed into a single release. Even if you're the owner of a recent version of *Photoshop*, the $169 upgrade fee is worth your money. While the changes may not be revolutionary, they represent a great leap forward on the evolutionary ladder. If nothing else, it's a bargain compared with earlier similarly priced updates. Granted, *Photoshop CS* is still largely the *Photoshop* we already know. It's deep, complex, and priced for those who plan to make a living using it.

—DWIGHT LOOI

MAXIMUM PC VERDICT 9

HEARTHROB

The most comprehensive update to *Photoshop* yet, and native RAW file format for digital images.

HEARTBURN

Recognition of rotated image data can get whacky. It's still a pricey piece of software.

$650 (full), $170 (upgrade), www.adobe.com

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Antivirus Altercation

Two commercial programs get beat by a free app!

Now more than ever, everyone needs antivirus software. To determine the best AV solution, we tested three popular products: *Norton AntiVirus 2004, McAfee VirusScan 8.0,* and the free version of *AVG Anti-Virus*.

How does a totally free antivirus choice stack up against two brick-and-mortar stalwarts? Read on to find out.

—WILL SMITH

Norton AntiVirus 2004

Norton is the gold standard for antivirus protection. The latest version adds several useful features, and one that's outright annoying.

Like any good antivirus software, *Norton* includes real-time virus scanning. In addition to scanning incoming e-mails and files you open on your hard drive, Norton now scans incoming instant messages in several popular protocols.

We've yet to see any viruses enter our PC through infected instant messages, but judging by the astounding pace of virus development over the last three years, it's probably inevitable. Note that *Norton* only protects the common clients—*AOL IM, MSN Messenger, Windows Messenger,* and *Yahoo IM*. It doesn't protect third-party clients like *Trillian* or even *ICQ*.

Norton caught all our test viruses. It also discovered and disabled several different types of spyware, including the *Gator* plug-in and the uber-annoying *CoolWebSearch* program. This warmed our hearts.

Norton automatically downloads and installs program and virus definition updates without any human input. The only time the program will make its presence known is when a virus is found, which is exactly what we like to see in an antivirus program.

What we don't want to see, however, is annoying product activation. Norton claims you'll be able to activate several computers with each installation, which we corroborated. We were able to activate the software on three machines, and reinstalled hardware on the machines with no adverse effects. Still, we don't like the idea of software that must check in with the manufacturer before it works.

McAfee VirusScan 2004

The latest *McAfee VirusScan* adds several much-needed features. E-mail scanning, IM scanning, and spyware detection are all new to the mix.

VirusScan detected all our test viruses, but detected only one of the spyware apps we installed on our test machine. It disabled *Gator*, but left the much more insidious *CoolWebSearch* installed. Of course, a definition update would make *VirusScan* capable of detecting and disabling the *CoolWebSearch* program.

Downloading and installing new virus definitions and software updates is reasonably unobtrusive. You can configure the app to automatically download new definitions. Each boxed copy of *VirusScan* includes a one-year subscription to virus updates.

Our main complaint with *VirusScan* is that it often feels like nothing more than an advertisement for other McAfee apps. Every time you start *VirusScan*, you're presented with a warning that your PC is only partially protected from evildoers. This leads into a promotion for the McAfee firewall and anti-spam software, which you're made to believe you need even if you have other firewall and anti-spam software already installed. That's not cool!

McAfee SecurityCenter
My Security Center
VirusScan
Personal Firewall+
Privacy Service
SpamKiller
My Security Index
These indices measure how secure your computer is. An index value of 10 is best, while 1 indicates a potential security risk.
My Security Index 5.8
My AntiVirus Index 10.0
My AntiHacker Index 1.0
My AntiAbuse Index 1.0
My AntiSpam Index 1.0
My Service Status
Specifies which McAfee security services are protecting your computer.
VirusScan Protecting
Personal Firewall Plus Not Installed
Privacy Service Not Installed
SpamKiller Not Installed

This is the first screen you see when you start *VirusScan*. Unfortunately, the "Security Index" is only a measure of the McAfee products installed, not your PC's security level.

AVG Anti-Virus

To give ourselves a point of comparison, we also tested the free version of AVG's *Anti-Virus* software. It's a compelling alternative, especially for home users. A commercial version is also available, but we were more interested in seeing what you sacrifice when using a free antivirus program.

Test Is Running
Scanning ...
Now Testing
C:\Documents and Settings\Will Smith\Local Settings\Temp\{BABCB62A-E049-...\Bbrd1.bmp
Test statistics
Number of Files Tested: 707 Bytes Tested: 1.63 GB
Number of Infected Files: 0 Last Virus Found:
Cancel Test

Anti-Virus managed to catch all our test viruses, but it didn't disable any spyware. The app automatically downloads new virus updates from the net, just like *McAfee* and *Norton*. It doesn't include any other bells or whistles, but we don't expect that from a free product. We did expect a bunch of ads, but surprisingly, the free antivirus software actually has fewer ads than *McAfee VirusScan*.

Anti-Virus does exactly what an AV program should do. It keeps viruses off your PC and doesn't annoy you when there are no virus-related problems.

We're duly impressed with the free version of *AVG Anti-Virus*. It does everything that more expensive AV products do, but without any extras.

Norton AntiVirus 2004

MAXIMUM PC VERDICT 8

+ WESTERN OMELET

Killing viruses is old hat, but getting rid of spyware at the same time makes us grin.

– EGG WHITE OMELET

Activation is a pain. Only one year of virus updates, after which you'll be haunted endlessly to renew.

$50, www.norton.com

McAfee VirusScan 2004

MAXIMUM PC VERDICT 6

+ MADDEN 2004

The software will adequately protect you.

– JOHN MADDEN

Annoying ads and a poorly designed interface. Only one year of virus updates, after which you'll be haunted endlessly to renew.

$50, www.mcafee.com

AVG Anti-Virus

MAXIMUM PC VERDICT 9

+ STUFF THAT'S FREE

Detected all test viruses, and did a full system scan in the same time as the other apps. Plus, it's free!

– STUFF THAT'S NOT FREE

Doesn't include any bells and whistles such as spyware scanning, but it's free!

Free, www.grisoft.com

Armed and Dangerous

A few clever ideas get lost in a sea of repetition

Zany weapons like the land shark gun, which fires a land shark that burrows underground and eats multiple enemies, are too few and far between in *Armed and Dangerous*.

Having tasted success with its wildly irreverent maiden title—*Giants: Citizen Kabuto*—Planet Moon Studios returns with an even wackier follow-up named *Armed and Dangerous*. Although the story and game characters are not related to *Giants* in any way, this fast-paced, over-the-top action game is similar in tone, style, and play. Unfortunately, it's not as fun or as groundbreaking as its predecessor.

Armed and Dangerous casts you as a member of a wacky trio of mercenary types intent on deposing a tyrannical king. Played from a behind-the-back, third-person perspective, the mission-based gameplay is fairly straightforward. A typical level involves walking from point A to point B and destroying a slew of bad guys and targets, along with virtually everything else in your path. Occasionally, your character sports a jetpack or gets to use a mounted gun to fend off sequential waves of attackers, but 90 percent of the game is the "shoot anything that moves" variety. Unfortunately, this gets old fast.

A big part of the tedium is that you end up using the same machine gun most of the time to shoot at the same two or three enemies, who look different but behave similarly. Special weapons like the land shark gun, black hole bomb, and topsy-turvy device (which plants a corkscrew into the ground and then flips the world upside down) are clever and fun to use, but you rarely gain access to them; and when you do, there's so little ammo they're almost worthless.

Full-motion video cutscenes advance the story between missions, and although these scenes are laugh-out-loud funny, the animation is overly compressed. We're baffled as to why the designers didn't use the game's graphics engine for these pre-rendered clips.

Ultimately, *Armed and Dangerous* reminds us of a typical post–Will Ferrell *Saturday Night Live* skit. It starts off entertaining, but degenerates into monotony as it milks the same gimmick over and over again.

—JOSH NOREM

MAXIMUM PC VERDICT 7

+ LOCKED AND LOADED

Clever weapons, funny story, and nice-looking graphics

– MOCKED AND BLOATED

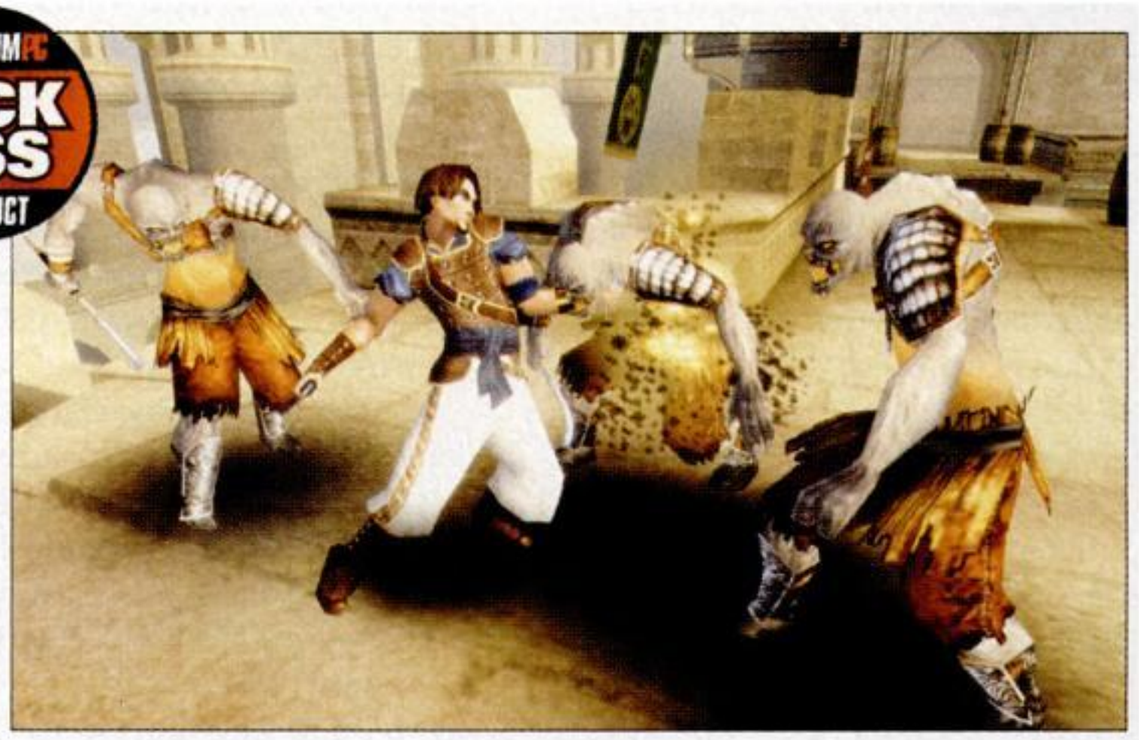
Linear and repetitive gameplay, and not enough use of fun weapons.

$40, www.lucasarts.com

Prince of Persia: The Sands of Time

This 3D adventure is like *Tomb Raider*, except fun

MAXIMUM PC KICK ASS PRODUCT



The prince can pull off some wicked combat maneuvers, including the ability to vault off an enemy's chest and hack him to pieces from behind on the way down.

You may not remember the original *Prince of Persia* game from 1989, or even the 3D Dreamcast version released a few years ago. You will, however, remember *Prince of Persia: The Sands of Time*. It's one of the best all-around games we've ever played.

In the game, you play as the noble prince, who inadvertently kills his family by opening up a floodgate of sorts that releases the Sands of Time. Your mission is to recollect the sand and hopefully turn back time in order to get your family back.

Over the course of this delightfully sophisticated 15-hour adventure, the prince encounters a variety of challenges ranging from gnarly jumping puzzles to battles with the undead. The play mechanics are biased toward tricky navigation and puzzles, and much like the original game, mainly consist of moving from location to location over chasms, cracks, buzz saws, spikey poles, and other potentially deadly hazards. *Prince of Persia's* genius is that these puzzles and sequences often challenge your mind more than your reflexes. And they rarely grow old, frustrating, or boring. Another great touch is the ability to rewind your most recent actions, which is handy for replaying fatal sequences.

When the affable prince isn't swinging around like a chimp, he's busy dishing out Persian pain. Hand-to-hand combat is excellent and sets a new standard for third-person fighting, thanks mostly to an arsenal of flamboyant moves and easy-to-use controls. The prince is capable of spectacular attacks and finishing moves that would make Jet Li jealous.

Unlike many third-person action adventures, *Prince of Persia's* controls are completely intuitive. The prince rarely missteps under your guidance, which makes leaping from precipice to precipice or from impossibly small ledge to hanging pole more enjoyable than we thought possible from jumping puzzles. On the other hand, the fixed third-person camera occasionally gets stuck in cramped spaces, which can be disorienting.

Camera issues aside, *The Sands of Time* is a brilliant game, and will surely surprise you. Anyone claiming to be a PC gamer should pick up this title. Otherwise, you'll be forced to forfeit your gamer card immediately.

—JOSH NOREM

MAXIMUM PC VERDICT 9

+ SANDY BEACH

Intriguing puzzles, superb combat, and stylish good looks.

– SANDY PANTS

Fixed camera can be annoying in tight spaces.

$50, www.princeofpersiagame.com

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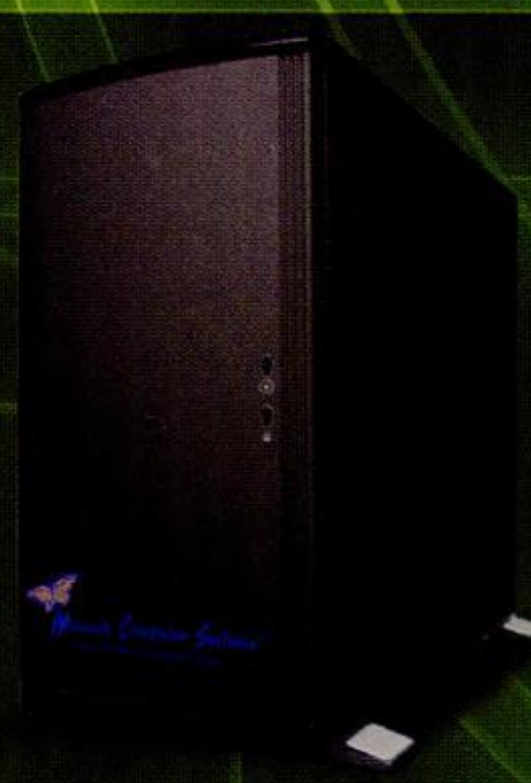

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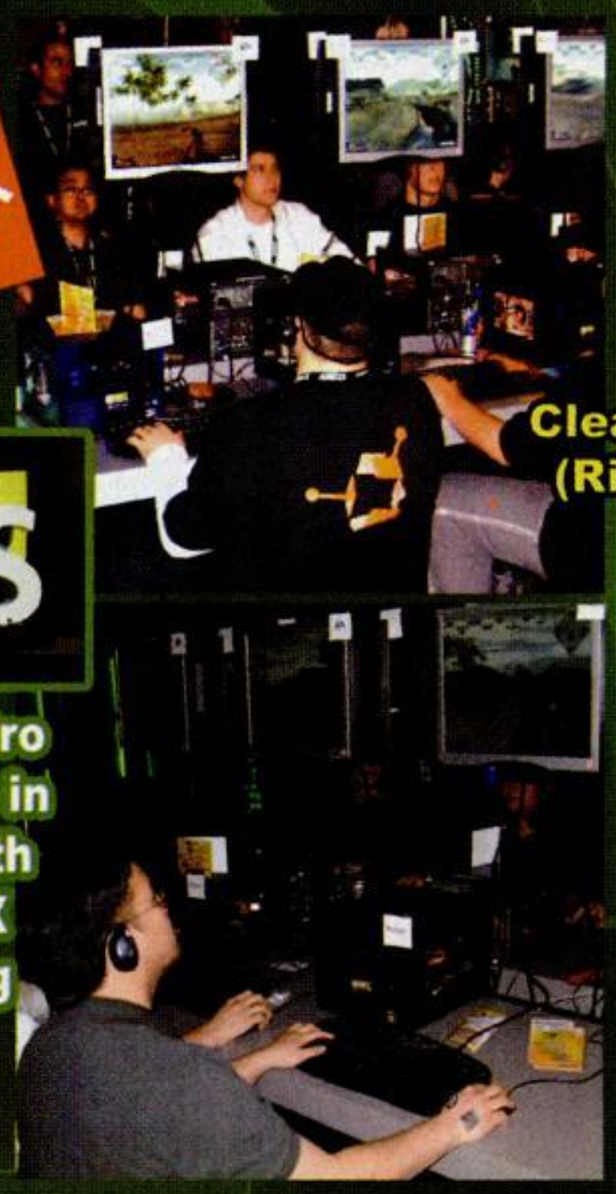

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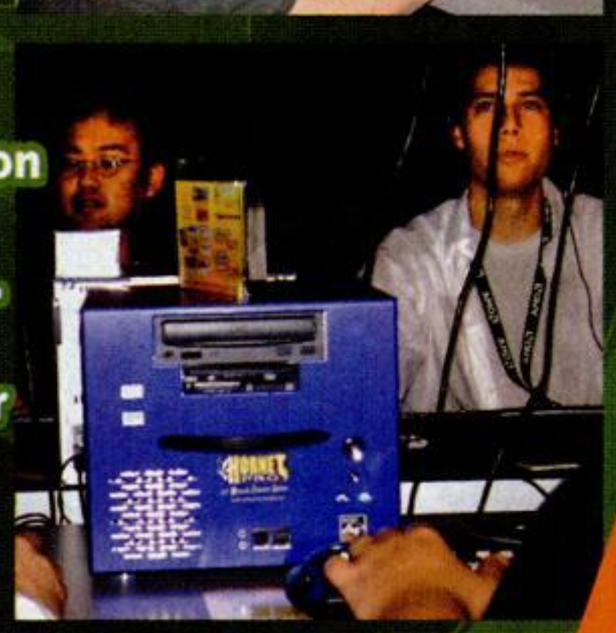

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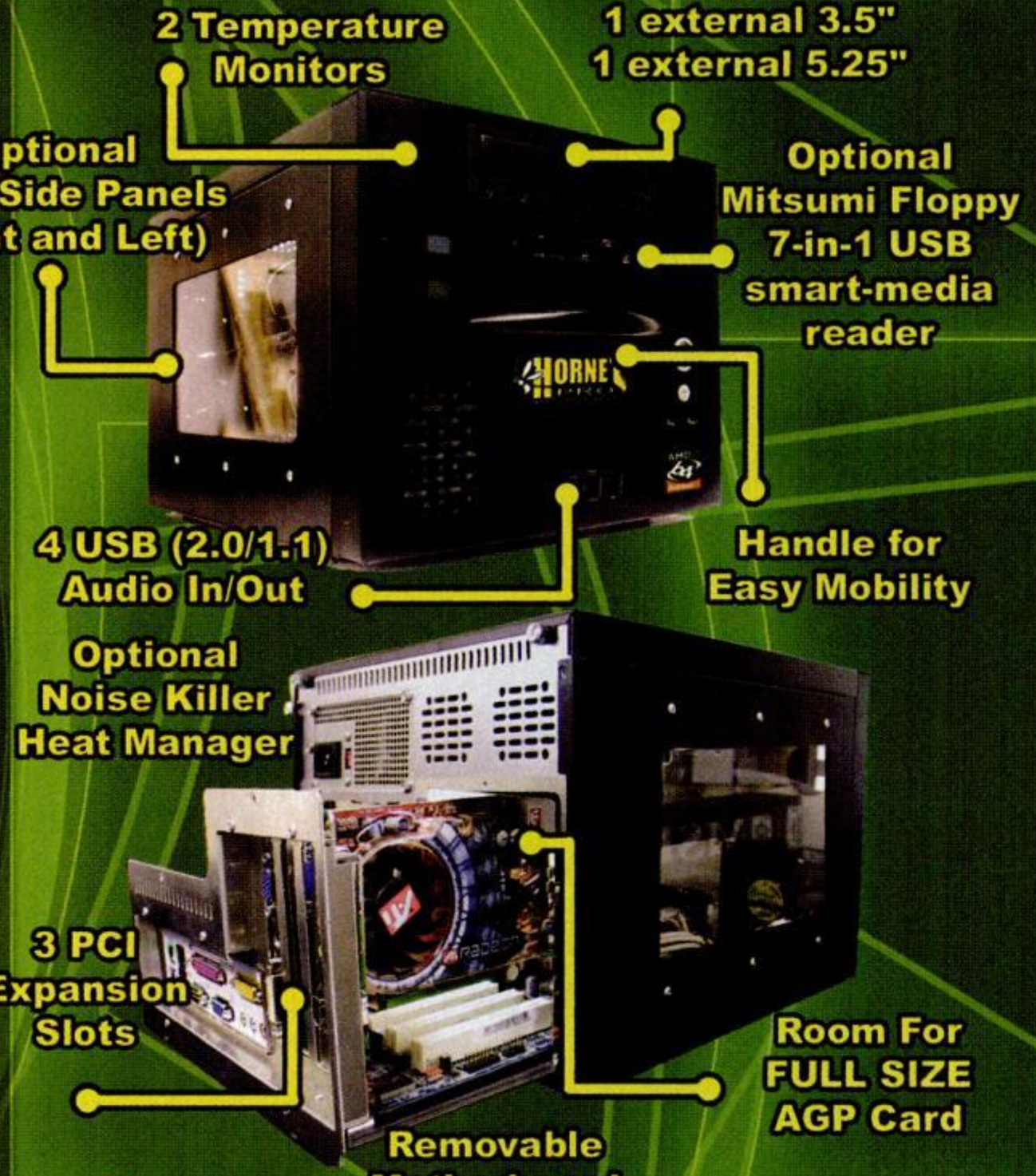
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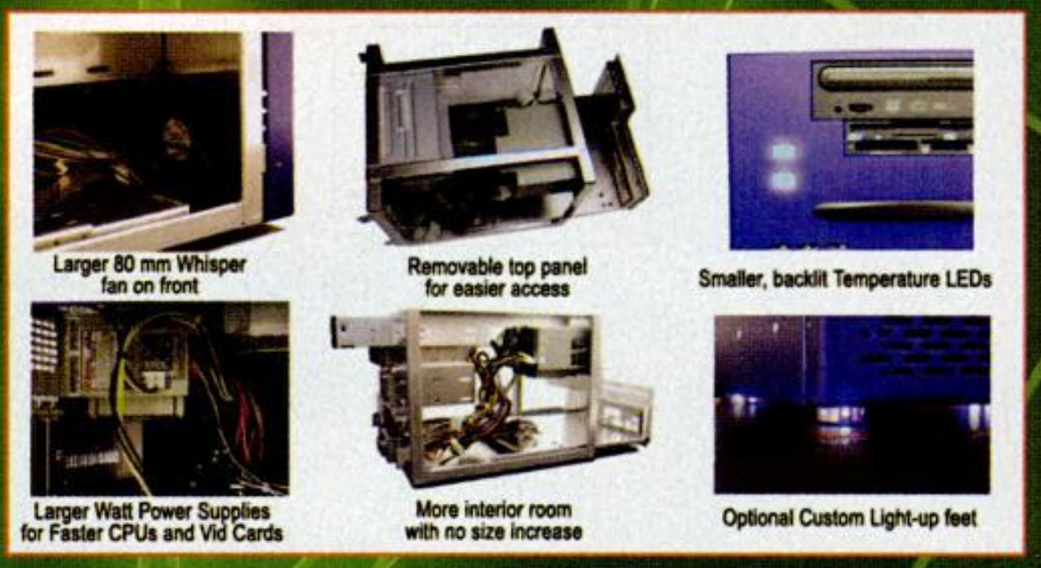
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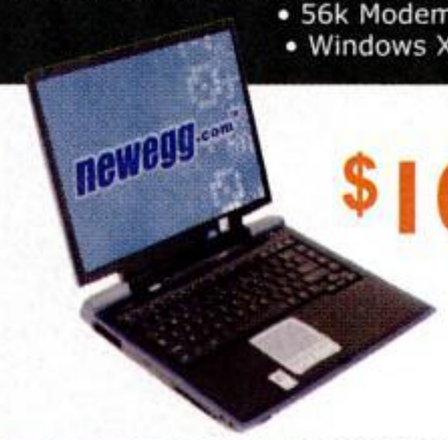

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MPC33124015 **$140.00**

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ABOX Entry
Inexpensive Entry Level PC

-Gamerboy Case w P4 400W Power Supply
-MSI KM2 Combo L K7 Motherboard
-AMD Athlon XP 2000+ Processor
-256 Mb DDR PC2100 266Mhz Memory
-80Gb 7200RPM HardDrive
-Pro Savage 2D 3D Video
-5.1 Channel Audio with 120 watt Speakers
-10/100 LAN
-52x32x52 CDRW
-1.44 mb 3.5" Floppy Drive
-Windows XP Home -Keyboard & Mouse
-Blue Cold Cathode Lighting
-Black Keyboard & Mouse
-Free Toll Free Lifetime Tech Support
-Built by HDC Certified Techs
-Full Manufacturer Warranties

$499

This Months New Items

Black Gamer Box
UltimateCombo!!
Includes Awesome Gaming Case with 400w P4 / AMD power supply, top power switch, built in case handle, windows, blue led fan and Blue Cold Cathode. Also includes Keyboard, Mouse and Speakers !!

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DVD 16X48 **$56**
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Pacific Digital Blue Lightning CDRW and DVD Drives for Gamers. Awesome Clear Bezel that Glows Blue when Running!

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-Extreme Graphics 2 Video
-6 Channel Audio with 120 watt Speakers
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-52x32x52 CDRW
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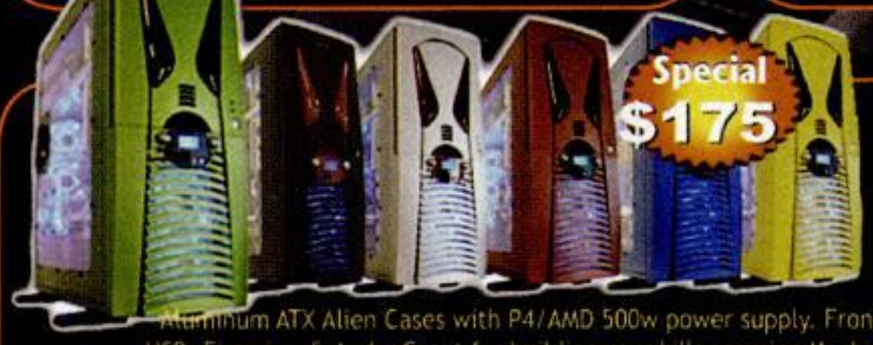
Cases Step 1



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Cooler Master ATX Case Aluminum 10 Bay WAVEMASTER **$160**

Motherboards Step 2

Asus	P4C800 Deluxe	$184	P4P800 Deluxe	$136
	P4P800VM	$110	P4C800E Deluxe	$193
Gigabyte	GA8IP900L	$91	GA8KNXPU	$376
Intel	D875PBZLK	$169	D865PERLX	$115
DFI	PRO875B	$196	865PE	$152
MSI	6565010	$189	PT8NEOLSR	$72
Soyo	P4I875PLAT	$184	P4I845PE	$96
Abit	IC7G	$175	IC7MAX3	$204
Asus	A7N8XX	$81	A7V8XX	$67
	A7V8XLFWSR	$99	A7N8X Deluxe	$127
Gigabyte	GA7VKMP	$63	GA7VT600L	$72
MSI	K7N2DILSR	$124	6738010	$65
Soyo	K7VMP	$73	KT400DULTRA	$90
	KT600DPLUS	$90	KT600DUPLAT	$137
DFI	KT400A Lanparty	$129	NF1IULTRA Lanparty	$156

Processors Step 3

Celeron	2.0 GHz 128 cache	$76	P4	2.4GHz 512k 800	$190
Celeron	2.4 GHz 128 cache	$85	P4	2.66GHz 512k 533	$182
Celeron	2.5 GHz 128 cache	$94	P4	2.6GHz 512k 800	$199
Celeron	2.6 GHz 128 cache	$102	P4	2.8GHz 512k 533	$220
Xeon	2.4GHz 512 cache	$252	P4	2.8GHz 512k 800	$242
Xeon	2.66GHz 512 cache	$301	P4	3.06GHz 512k 533	$292
Xeon	2.8GHz 512 cache	$367	P4	3.0GHz 512k 800	$308
Xeon	3.06GHz 512 cache	$499	P4	3.2GHz 512k 800	$453
P4	2.4GHz 512k 533	$184	P4 Extreme	3.2GHz 2Mb 800	$999
XP	2100+ Retail 266Mhz	$78	XP	3000+ Retail 333Mhz	$222
XP	2200+ Retail 266Mhz	$83	XP	3200+ Retail 400Mhz	$350
XP	2400+ Retail 266Mhz	$93	Opteron	240 1.4Ghz 64bit	$230
XP	2500+ Retail 333Mhz	$100	Opteron	242 1.6Ghz 64bit	$354
XP	2600+ Retail 333Mhz	$114	Opteron	244 1.8Ghz 64bit	$499
XP	2700+ Retail 333Mhz	$133	Athlon64	3200+ 1600Mhz	$330
XP	2800+ Retail 333Mhz	$158			

Memory Step 4

SDRAM

All Components	PC133 512MB 32X8 133MHz		$89

DDR Memory

Crucial	PC2100 128MB	DDR266	CT1664Z265	$34
Crucial	PC2100 256MB	DDR266	CT3264Z265	$52
Crucial	PC2100 512MB	DDR266	CT6464Z265	$80
Crucial	PC2700 128MB	DDR333	CT1664Z335	$37
Crucial	PC2700 256MB	DDR333	CT3264Z335	$56
Crucial	PC2700 512MB	DDR333	CT6464Z335	$95
Crucial	PC3200 256MB	DDR400	CT3264Z403	$59
Corsair	PC3200 512MB	DDR400	CMX5123200C2	$139
Kingston	PC3500 256MB	HyperX434	KHX3500256	$86
Kingston	PC3500 512MB	HyperX434	KHX3500512	$147

HardDrives Step 5

Maxtor	80GB	7200rpm	ATA 133	6Y080L0	$78
Maxtor	120GB	7200rpm	ATA 133	6Y120P0	$108
Maxtor	160GB	7200rpm	ATA 133	6Y160P0	$136
Maxtor	160GB	7200rpm	SATA	6Y160M0	$145
Maxtor	250GB	5400rpm	ATA 133	4A250D0	$237
Seagate	80GB	7200rpm	ATA 133	ST380011A	$80
Seagate	160GB	7200rpm	ATA 133	ST3160023A	$137
Seagate	80GB	7200rpm	SATA	ST380013AS	$90
Seagate	120GB	7200rpm	SATA	ST3120026AS	$118
Seagate	160GB	7200rpm	SATA	ST3160023AS	$149
WD	80GB	7200rpm	ATA100	WD800JB	$87
WD	120GB	7200rpm	ATA100	WD1200JB	$107
WD	200GB	7200rpm	ATA100	WD2000JB	$188
WD	36GB	10000rpm	SATA	WD360GD	$135
WD	74GB	10000rpm	SATA	WD740GD	$277
IBM	80GB	7200rpm	SATA	13G0252	$89
IBM	160GB	7200rpm	SATA	13G0254	$164
IBM	250GB	7200rpm	SATA	13G0255	$302

Video Cards Step 6

EVGA	256A8N318TX	GEFORCE FX 5600XT 256MB TV/Out	$135
EVGA	128A8N336AX	GEFORCE FX 5700 Ultra 128MB DDR	$177
EVGA	128A8N306L6	GEFORCE FX 5200 128MB DDR VO/DVI	$84
EVGA	256A8N338AX	GEFORCE FX 5950 256 MB DDR VIVO	$443
Asus	V9520TD	GEFORCE FX 5200 128MB VIVO/DVI	$90
Asus	V9560TD	GEFORCE FX 5600 128MB VIVO/DVI	$167
Asus	V9980ULTRA	GEFORCE FX 5950 256MB DDR VIVO/DVI	$512
MSI	MS8911	GEFORCE FX5200 128MB DDR VI/DVI	$75
MSI	FX5700VTD256	GEFORCE FX 5700 256MB VIVO/DVI	$207
MSI	FX5950UVTD25	GEFORCE FX5950 256MB DDR VIVO/DVI	$448
ATI	100436006	Radeon 9200 128MB DDR TV-Out	$97
ATI	100437100	Radeon 9600 XT 128MB DDR VI/DVI	$183
ATI	100435100	Radeon 9800 XT 128MB DDR 8x AGP	$483
ATI	100713100	Radeon AIW Radeon 9800Pro 128MB DDR	$363
Creative	01000065XXX	Wildcat VP VP0560 64MB	$134
Creative	01000078XXX	Wildcat VP880 PRO 256MB	$437

Sound Cards Step 7

Creative Labs Audigy 2 Platinum is also available in Black, Silver, Blue, Yellow & Green
Audigy 2 Platinum Black Bezel $19

Turtle Beach	Santa Cruz 32-bit	$75
Turtle Beach	Audiotron 100 Dig Player	$277
Creative Labs	Sound Blaster Live! 5.1	$34
Creative Labs	Audigy X Gamer	$76
Creative Labs	Audigy 2 ZS	$95
Creative Labs	Audigy 2 ZS Platinum	$176
Creative Labs	Audigy 2 ZS Platinum Pro	$226

Creative Labs Sound Blaster Extigy USB External Sound Card With Remote.

$133

CD-R/RW/DVD/DVD-RW & Floppy Drives Step 8

Don't be fooled by the other guys selling colored components. Our Colored Components Have been Maximum PC GEEK Tested and Approved. Tested against scratches, stains, heat, washability, and durability.

CDRW Drives

				Beige	Color
52x24x52	IDE	Iomega 32583 USB 2.0	$100	N/A
52x32x52	IDE	Plextor PREMIUM USB 2.0	$149	N/A
52x32x52	IDE	Plextor PXPREMIUM	$99	$114
52x24x48	IDE	TDK AI-5200	$83	$98
52x24x52	IDE	Samsung SW252FRNS	$48	$63
52x24x52	IDE	Lite-On LTR52327S	$48	$63
52x24x52	IDE	BenQ 5224P	$48	$63
52x24x52	IDE	Pacific Digital U-30146	$66	$81
52x24x52	IDE	Sony CRX320A Combo	$92	$107
52x32x52	IDE	Samsung SM352BRNS Combo	$69	$84
52x24x52	IDE	Teac CDW552	$57	$72
52x24x52	IDE	MSI CR52M	$48	$63
40x12x40	SCSI	Plextor PXW4012TS/SW	$215	$230

DVD Drives

			Beige	Color
16x/48x	IDE	Toshiba SDM1712TA	$45	$60
16x/48x	IDE	Sony DDU1621	$44	$59
16x/40x	IDE	Pacific Digital U-30115	$57	$72
16x/40x	IDE	Pioneer DVD Tray DVD120	$47	$62
16x/40x	IDE	BenQ DVD1648A	$42	$57
16x/48x	IDE	Samsung SD816BRPS 16x/48x	$45	$60
10x/40x	SCSI	Pioneer DVD305S	$100	$115

CD-ROM Drives

52x	IDE	Lite-On LTN526	$30	$45
52x	IDE	Creative Labs BLASTER52X	$32	$47
56x	IDE	BenQ CD656A	$29	$44

DVD-RW Drives

24x10x32	IDE	Sony DVD+R/RW DRU510A	$219	$234
2.5x	IDE	PDC DVD+R/RW CDRW U30134	$280	$295

Floppy Drives

Mitsumi	IDE	1.44MB D359M3	$13	$17
Sony	IDE	1.44MB MPF920	$13	$21

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IBOX ENTRY

Case	Black Gamerbox Combo with 400watt Power Supply
Motherboard	Intel® 865GLCLK 800MHz SATA AGP8X
CPU	Intel® Pentium® 4 2.6GHz with Hyper Threading Technology
Memory	256MB DDR PC3200 400MHz Memory
Hard Drive	80GB 7200 RPM Ultra ATA/100 Hard Drive
Video	Intel® Extreme Graphics 2
Audio	SoundMAX 4 XL with AudioESP audio subsystem
Modem	Creative Labs 56k V.92 PCI Modem
CDRW	52x32x52 IDE Internal CD-RW w/HDC Black Bezel
DVD	16x DVD Player with Black Bezel
Floppy	Mitsumi 1.44 3.5" Internal Floppy
Speakers	120 Watts - 2-Channel Stereo Amplifier
Keyboard	Windows 98/ME/2000/NT/XP &PS/2 & USB Fully Compatible
Mouse	400CPI sensative 2 Button Scrollable
Operating Sys	Microsoft Windows XP Home Edition CD Version OEM
Case Mods	12" Blue Cold Cathode light kit
Labor	Labor, Building, Loading O.S., Testing

add 15" LCD Flat Panel Monitor $279

Case	Black Gamerbox Combo with 400watt Power Supply
Motherboard	Intel® 865PERLX P4 800MHz SATA AGP8X ATX
CPU	Intel® Pentium® 4 2.6GHz with Hyper Threading Technology
Memory	512MB DDR PC3200 400MHz Memory
Hard Drive	120GB Serial ATA 7200RPM 8Mb Hard Drive
Video	GeForce FX5600XT 256MB DDR
Audio	6-channel audio Onboard
Modem	Creative Labs 56k V.92 PCI Modem
CDRW	52x32x52 IDE Internal CD-RW w/HDC Black Bezel
DVD	16x DVD Player with Black Bezel
Floppy	Mitsumi 1.44 3.5" Internal Floppy
Speakers	120 Watts - 2-Channel Stereo Amplifier
Keaboard	Windows 98/ME/2000/NT/XP &PS/2 & USB Fully Compatible
Mouse	400CPI sensative 2 Button Scrollable
Operating Sys	Microsoft Windows XP Home Edition CD Version OEM
Case Mods	12" Blue Cold Cathode light kit
Labor	Labor, Building, Loading O.S., Testing

add 15" LCD Flat Panel Monitor $279

$899

IBOX MID

Case	Black Gamerbox Combo with 400watt Power Supply
Motherboard	Intel® D875 800Mhz SATA Bananza Motherboard
CPU	Intel® Pentium® 4 3.0GHz with Hyper Threading Technology
Memory	512MB DDR PC3200 400MHz Memory CL25
Hard Drive	120GB Serial ATA 7200RPM 8Mb Hard Drive
Video	GeForce FX 5950 Ultra 256MB VIVO Video Card
Audio	Creative Labs Audigy2 ZS Surround Sound Card
Modem	Creative Labs 56k V.92 PCI Modem
CDRW	52x32x52 IDE Internal CD-RW w/HDC Black Bezel
DVD	16x DVD Player with Black Bezel
Floppy	Mitsumi 1.44 3.5" Internal Floppy
Speakers	120 Watts - 2-Channel Stereo Amplifier
Keaboard	Windows 98/ME/2000/NT/XP &PS/2 & USB Fully Compatible
Mouse	400CPI sensative 2 Button Scrollable
Operating Sys	Microsoft Windows XP Home Edition CD Version OEM
Case Mods	12" Blue Cold Cathode light kit
Labor	Labor, Building, Loading O.S., Testing

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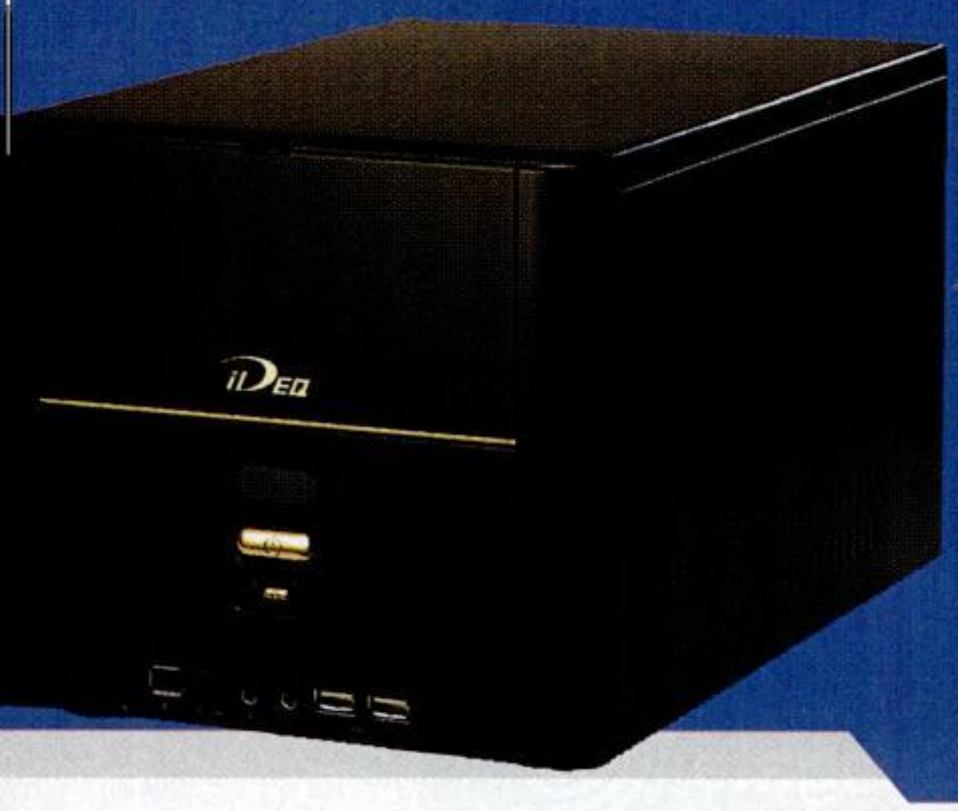

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Athlon XP Barton 2500+	$92
Athlon XP 2700+	$114
Athlon XP 2600+	$107
Athlon XP 2400+	$80
Athlon XP 2200+	$69
Athlon XP 2000+	$62
Athlon XP 1800+	$53

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2.8 GHz 533FSB 512K	$202
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2.53 GHz 533FSB 512K	$167
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2.0 GHz 400FSB 512K	$134
1.8A GHz 400FSB 512K	$133
CELERON FCPGA2/478	
Celeron 2.4GHz s478	$74
Celeron 2.3GHz s478	$84
Celeron 2.2GHz s478	$69
Celeron 2.0GHz s478	$66
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SATA-MAXTOR	
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CNPS 6000-CU SKT A	$32
CNPS 7000A-CU	$38
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NETWORKING

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3Com 10/100	$29
Intel Pro 10/100	$28
Intel Pro/1000MT	$58
CABLE/DSL ROUTERS	
Linksys 4 Port Router	$57
Belkin4 Port Router	$59

CD-RW

52x24x52 Samsung w/DVD	$67
52x32x52 Lite-On BLK	$46
52x32x52 Lite-On	$49
52x32x52 MSI Retail	$46
52x24x52 Samsung	$44

DVD ROMS

16X Samsung	$40
16X Lite-On	$42
16X Lite-On Black	$42

MEMORY

DDR	
256MB PC2100	$43
512MB PC2100	$82
256MB PC2100 REG ECC	$69
512MB PC2100 REG ECC	$116
1.0GB PC2100 REG ECC	$243
256MB PC2700	$46
512MB PC2700	$81
256MB PC3200	$50
512MB PC3200	$90
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64MB PC133	$23
128MB PC133	$40
256MB PC133	$58
512MB PC133	$114
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512MB REG NON-ECC	$119
512MB REG ECC	$129
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GeForce FX 5900 SE 256MB	$243
GeForce FX 5200 Personal Cinema	$175
MSI	
TV Anywhere Master	$60
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AIW 9800 PRO 128MB	$384
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RADEON 9200 128MB	$87
RADEON 9600 128MB	$174
RADEON 9800 128MB	$305
RADEON 9800 256MB	$479

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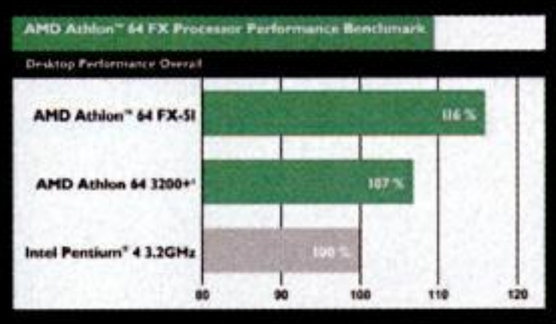

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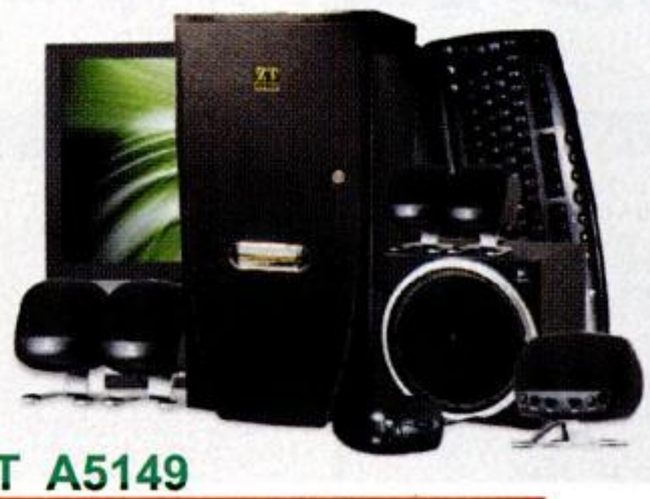

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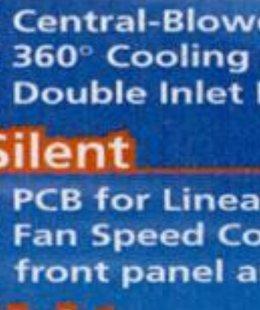

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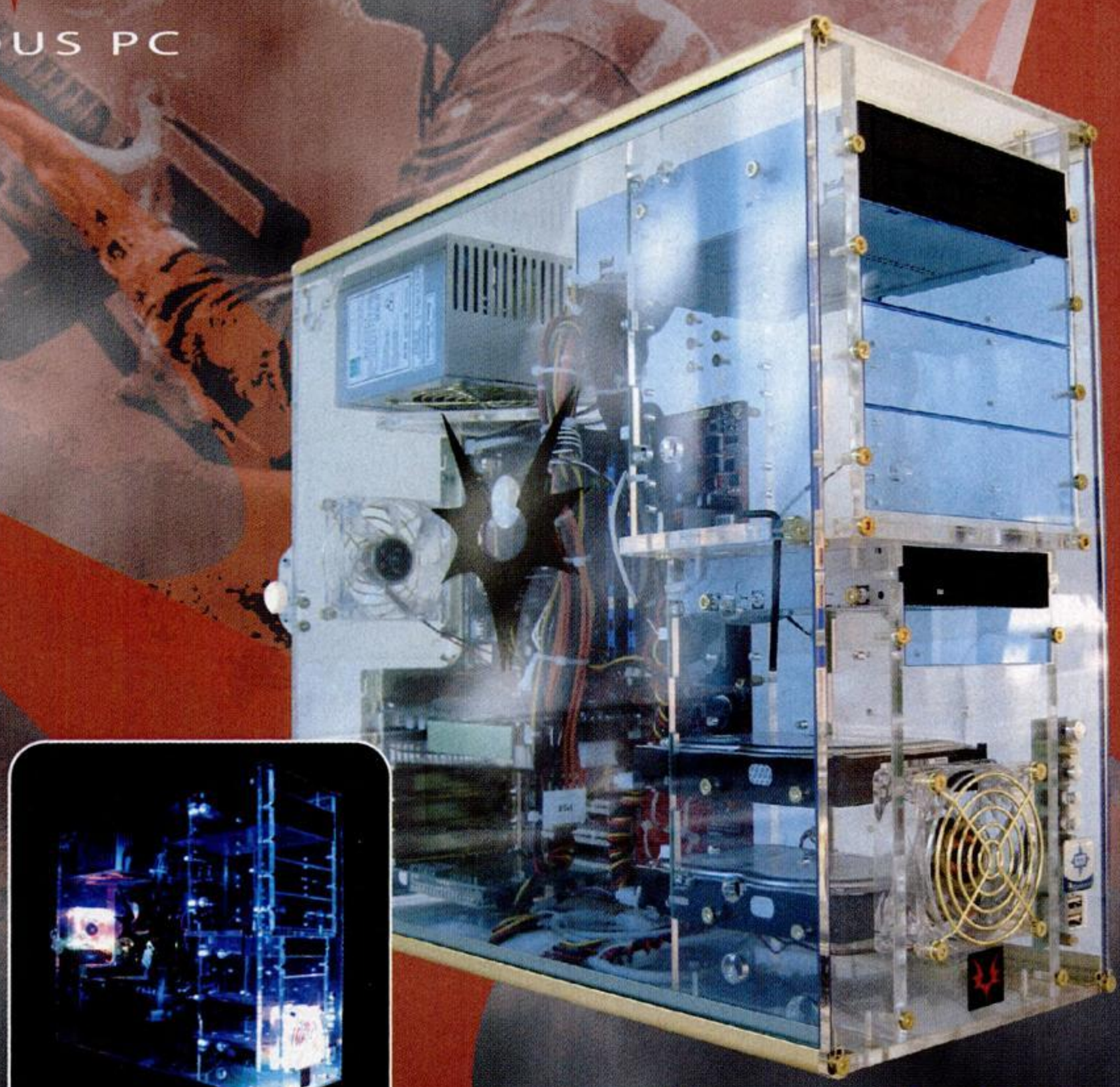

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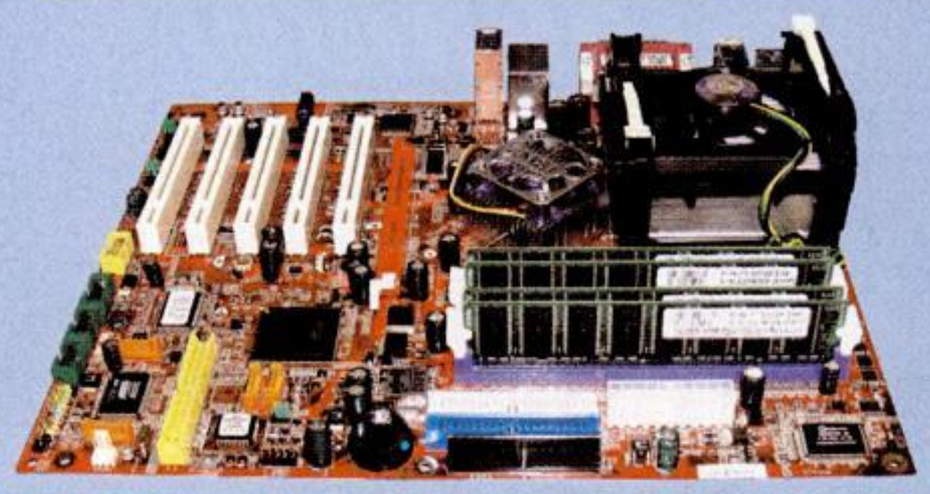

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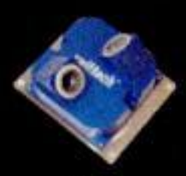

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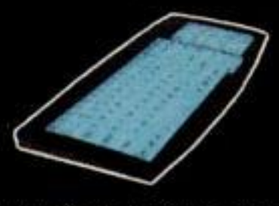

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If your modded PC is chosen as a Rig of the Month, it will:

- **(1) Be featured before all the world in *Maximum PC*, and**
- **(2) Win you $1,000 and a case of BAWLS high-caffeine soft drink.**

So what's stopping you?

TO ENTER: Your submission packet must contain your name, street address, and daytime phone number; no fewer than three high-res JPEGs (minimum size 1024x768) of your modified PC; and a 300-word description of what your PC represents and how it was modified. E-mailed submissions should be sent to **rig@maximumpc.com**. Snail mail submissions should be sent to Rig of the Month, c/o Maximum PC, 150 North Hill Drive, Suite 40, Brisbane, CA, 94005.

The judges will be *Maximum PC* editors, and they will base their decision on the following criteria: creativity and craftsmanship.

ONE ENTRY PER HOUSEHOLD. Your contest entry will be valid until (1) six months after its submission or (2) May 1, 2004, whichever date is earlier. Each month a winner will be chosen from the existing pool of valid entries, and featured in the Rig of the Month department of the magazine. The final winner in this contest will be announced in the July 2004 issue. Each of the judging criteria (creativity and craftsmanship) will be weighed equally at 50 percent. By entering this contest you agree that Future Network USA, Inc. may use your name, likeness, and web site for promotional purposes without further payment. All prizes will be awarded and no minimum number of entries is required. Prizes won by minors will be awarded to their parents or legal guardians. Future Network USA is not responsible for damages or expenses that the winners might incur as a result of the Contest or the receipt of a prize, and winners are responsible for income taxes based on the value of the prize received. A list of winners may also be obtained by sending a stamped, self-addressed envelope to Future Network USA, Inc., c/o Rig of the Month, 150 North Hill Drive, Brisbane, CA 94005. This contest is limited to residents of the United States. No purchase necessary; void in Arizona, Maryland, Vermont, Puerto Rico, and where prohibited by law.

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MAXIMUM PC Rig of the Month

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THIS MONTH: Barney Lascola's "Come Fly with Me"

Barney Lascola is no stranger to publicity. A modder from way back, he made the cover of *Hot Rod* magazine when he converted a van's interior with custom décor—the first ever, he says.

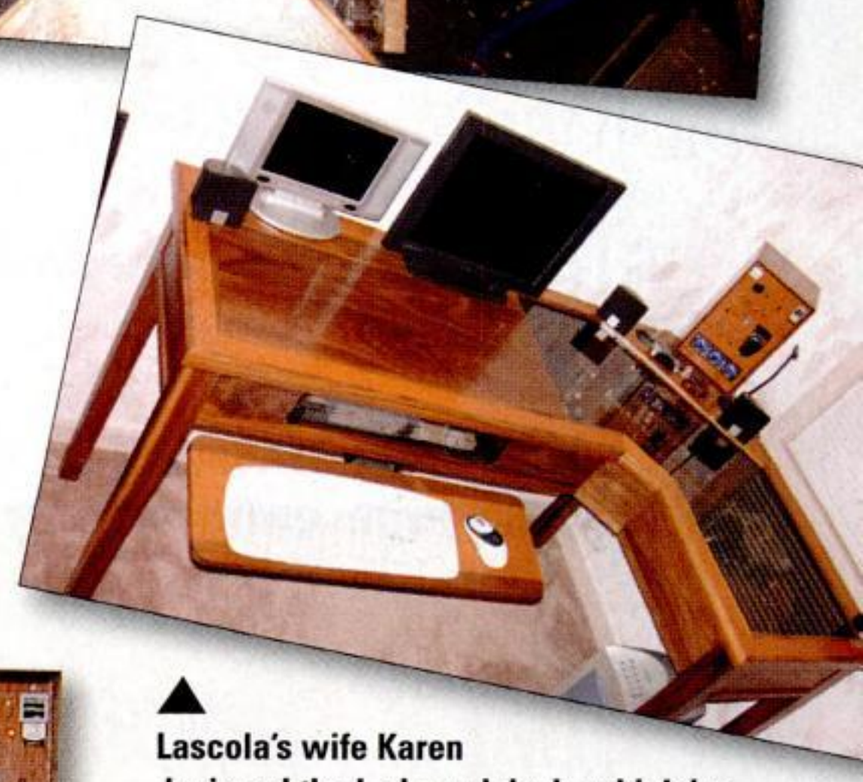
His most recent project—a PC tidily tucked away in a hand-crafted desk—was explicitly designed to combat his two pet peeves, wires and racket. The former he eliminated by routing all cables through a hollowed-out leg of the desk; a Koolance waterblock takes care of the latter by keeping noisy fans to a minimum.

That's not to say the PC is imperceptible. Far from it. It's in plain sight beneath the bronze-tinted glass desktop. What's more, a second power supply is devoted to illuminating the PC's works even when it's not booted.

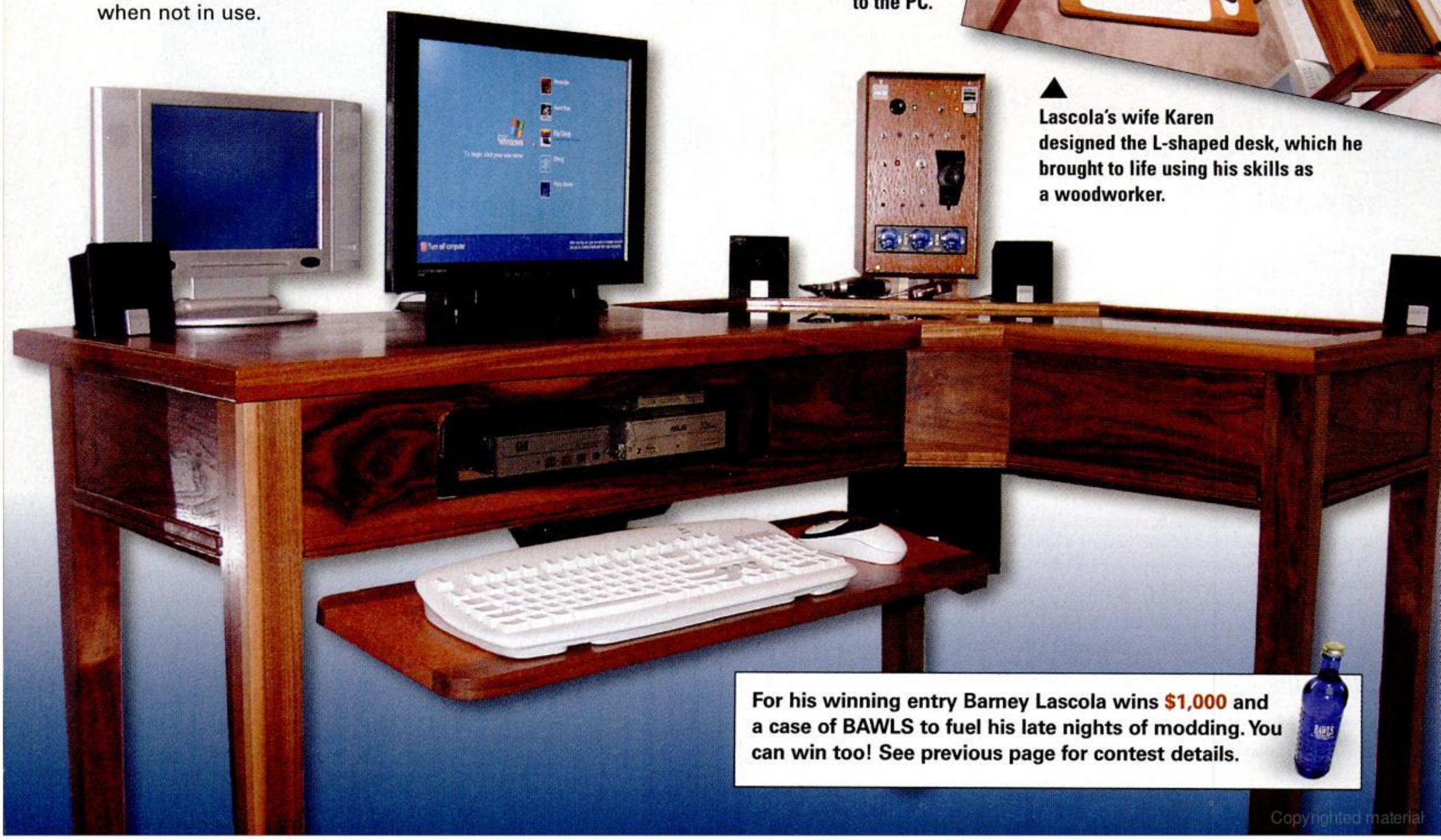
Currently, Lascola is awaiting the arrival of custom spring-loaded struts for the removable desktop. He's also devising a hydraulic system that will keep the displays out of sight when not in use.

Nestled within this enclosure of solid black walnut, exotic lacewood, and mahogany are an AMD FX51 CPU, four matched sticks of registered Corsair 512MB memory, a Sound Blaster Live Platinum, and an Asus V9980 Ultra 256 videocard, to name just a few of the occupants.

The control panel was the most challenging aspect of the project, taking Lascola more than 60 hours to hard wire. A single button first starts the water pump, and then once its circuit is complete, juice is fed to the PC.



Lascola's wife Karen designed the L-shaped desk, which he brought to life using his skills as a woodworker.



For his winning entry Barney Lascola wins $1,000 and a case of BAWLS to fuel his late nights of modding. You can win too! See previous page for contest details.

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